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SUMMARY REPORT ON "INVESTIGATION OF METAL PROCESSING OPERATIONS.(U)
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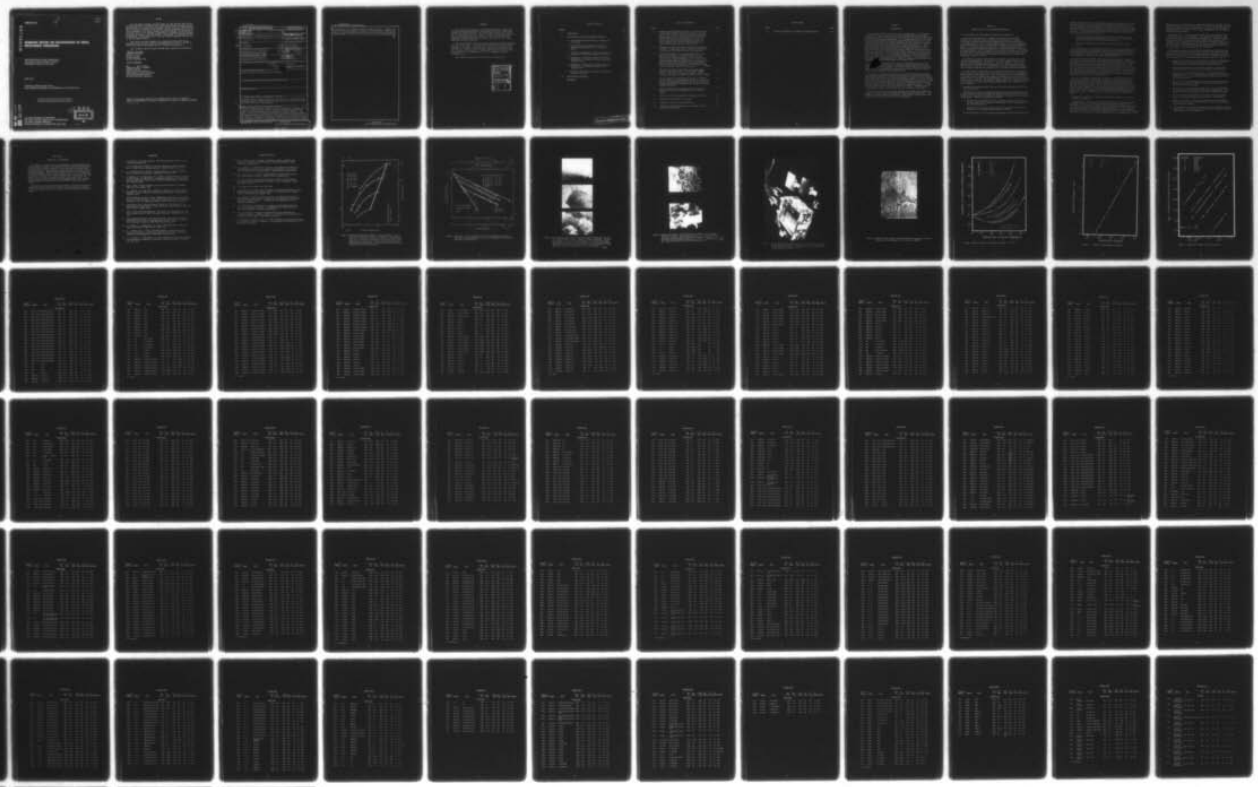

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SUMMARY REPORT ON INVESTIGATION OF METAL PROCESSING OPERATIONS

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED ENERGY SYSTEMS DIVISION
PITTSBURGH, PENNSYLVANIA 15236

APRIL 1977

TECHNICAL REPORT AFML-TR-77-75
FINAL REPORT FOR PERIOD 15 DECEMBER 1973 TO 22 MARCH 1977

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AIR FORCE MATERIALS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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ATTWELL M. ADAIR
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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report summarizes the findings of several investigations involving the influence of process variables on the production of shapes with specified geometry, controlled microstructure and controlled structural integrity. The studies include the room temperature strengthening influence of grain boundary and subgrain boundary effects resultant from deformation of aluminum alloys; the microstructure and mechanical properties of extrusion consolidated 7075 Al powder; evaluation procedures for determining characteristics of workpiece coatings for isothermal forging; and the development and evaluation of separation-lubri-

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cation substances for titanium isothermal forging operations. Information derived from these investigations was applied to the processing of numerous experimental metalworking operations related to other alloy and processing development programs of interest to the Air Force and other government agencies.

FOREWORD

This report was prepared by the Westinghouse Electric Corporation, Advanced Energy Systems Division, Pittsburgh, Pennsylvania, under USAF Contract No. F33615-74-C-5059. The project was initiated under Project No. 7351, "Metallic Materials", Task No. 735108, "Processing of Metals", and was administered under the direction of the Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio, with Mr. A. M. Adair (AFML/LLM) as Project Engineer.

The work described in this report was carried out between 15 December 1973 and 22 March 1977. Technical support was provided by Westinghouse personnel, D. J. Abson, T. E. Jones, M. M. Myers, R. A. Sweeney, T. M. Brown and R. D. Mobley. Contributions by AFML personnel have been made by A. M. Adair and V. DePierre. Sub-sections D and E of Section 2 were accomplished as a sub-program effort by W. D. Spiegelberg of TRW, Cleveland, Ohio.

This report was submitted by the author on 24 March 1977.

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SECTION I

INTRODUCTION

The experimental effort described in this investigation is a continuation of work [1-16] carried out at the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio to advance the science and technology of metal deformation processing for aerospace applications. The principal objective of this effort was to determine quantitative metalworking process design procedures for the selection and control of processing parameters for the production of metallic shapes with desired external geometry and internal microstructure. The program consisted of three tasks which were conducted concurrently at the Experimental Metals Processing Laboratory at the Wright-Patterson Air Force Base. The first task entailed process design studies for metalworking operations, for the production of defect-free metallic shapes with controlled internal microstructure. The work performed under this task entailed an analysis of the effects of hot work deformation structure on the room temperature of alloys. This effort was limited to aluminum alloys. Also included in this task was an investigation of the effects of microstructure and mechanical properties of extrusion-consolidated 7075 aluminum alloy.

The [illegible]d task entailed process studies of emerging processes and new mater[illegible]d included evaluation of these materials and processes for the prod[illegible] Air Force hardware. The effort in this task was concerned with the [illegible]ation and development of separation-lubrication workpiece coating substances for isothermal forging applications.

The third task entailed the utilization of optimum processing parameters and techniques, both those developed in the first two tasks and those gained from previous experience, to process experimental materials from alloy development programs of the Air Force and other government agencies. The aim of this task was to obtain the maximum yield of sound material for metallurgical evaluation. The work performed under the third task included extrusion, forging, rolling, swaging, melting and heat treatment of experimental alloys. A total of 3638 billets and bars were processed for this effort. Tabulated data on the extrusions carried out under this task are included in this report.

The major portion of the research findings have already been presented in detail in the form of Air Force Materials Laboratory Technical Reports. Only summaries of these studies are presented in this report, together with brief discussions of work which has not yet been published.

SECTION II

INVESTIGATION OF METAL PROCESSING OPERATIONS

A. Grain Boundary and Sub-Boundary Strengthening in Aluminum[17]

Data on the room temperature strength of polycrystalline aluminum appearing in literature, have been analysed to separate and to compare the strength contributions from grain boundaries and from sub-boundaries; it has been shown that, for the same boundary density, cold work and annealed sub-boundaries make a greater contribution to strength than grain boundaries Figure 1. The analysis has also shown that hot work sub-boundaries make a smaller contribution than grain boundaries for subgrain and grain sizes larger than approximately 3×10^{-6}m Figure 2.; below this size, however, hot work sub-boundaries make the greater contribution to strength, and this becomes comparable with the strength contribution expected from cold work and anneal sub-boundaries at about 1×10^{-6}m.

In a Hall-Petch type of relationship, the subgrain size exponents can be regarded as approximately -3/2 and -2/3 for hot work subgrains and for cold work and anneal subgrains, respectively. For these analyses, the observed subgrain sizes were adjusted by subtracting out the density of grain boundaries since, at least for the cold worked material, the strength contribution from the grain boundaries was accounted for in a separate Hall-Petch analysis.

The sub-boundary strength data for hot work sub-boundaries are consistent with a model in which the density of dislocation sources in the sub-boundaries varies markedly with subgrain size. For cold work and anneal sub-boundaries, the extent of such a variation is minimal; an exponent of -1/2 may be used in empirical fits of the data if a non-uniformity is permitted in the size of subgrains within each grain. According to a simple model, the strength contribution is determined by the size of the larger subgrains which are distant from the grain boundaries.

B. Microstructure and Mechanical Properties of Extrusion-Consolidated 7075 Al Prealloyed Powder[19]

Microstructural changes occurring during the extrusion-consolidation of prealloyed 7075 stock were investigated and compared with those occurring in the wrought stock (from which the powder was produced) processed in the same manner as the powder. Emphasis is placed on two areas:

1. The effects of processing variables (starting material condition, processing temperature and amount of deformation) on the microstructure of the processed material.

2. Correlation of the product microstructures with product room tensile properties after a final standard T6 heat treatment.

The microstructure of the extrusion-consolidation powder product differed in

several respects from that of the wrought stock product extruded by the same processing conditions. The latter had a uniform microstructure while the former contained a marked inhomogeneity of both the distribution of the precipitate and the size of the substructure or grain structure (from one powder particle to another) and the presence of oxide boundaries on deformed powder particles. The differences are attributed to the following characteristics of the starting materials, Figures 3, 4.

1. The powder consisted of chilled cast particles coated with oxide films and containing elements (such as chromium) in various degrees of super-saturated solution in different particles.

2. The wrought material was homogeneous without any apparent oxide films.

The microstructure within the powder particles of the extruded powder product approached that of the wrought material as the processing variables converted the particle cast structure to the same original condition as the wrought material. However, none of the processing variables were beneficial in the removal of the oxide film around the powder particles.

Extrusion-consolidated 7075 powder which had not been given a long time high temperature anneal yields lower tensile strengths than the extruded ingot product. This difference is the result of the occurrence of an equiaxed recrystallized grain structure rather than a hot work substructure. The powder product also shows inferior ductility as a result both of the oxide film at the prior particle boundaries and of interparticle voids in the product which arise from incomplete consolidation at the lowest extrusion ratios and from excessive deformation at the high extrusion ratios. In both cases, these voids were more numerous after the T6 heat treatment implying limited bonding at prior particle interface surfaces.

Use of the separate consolidation and extrusion operations at extrusion ratios of 10:1 and 20:1 yields powder product with a fine subgrain and recrystallized grain size. The chromium containing precipitates from these two-step processed material is similar to that in the ingot product. Comparison of the powder product from the two-step processes with that from the one-step process suggests that the formation of this precipitate has a significant effect on limiting the grain size resulting from primary recrystallization. The tensile strength of the two-step processed powder material is comparable to that of the ingot product but the ductility is significantly lower.

C. Evaluation Techniques for Separation-Lubrication Coatings for Isothermal Forging of Titanium[20]

The selection of satisfactory separation-lubrication coating substances for isothermal forging of titanium alloys poses a formidable challenge to the achievement of the potential economic advantages from this metalforming technique. The challenge stems from the nature of titanium alloys and of the isothermal forging process which impose several requirements on the separation-lubrication coating. The principal requirements are: (1) complete environmental protection of the workpiece, (2) low interface friction characteristics, (3) low

adhesion with the die material, (4) controlled build-up on the die, (5) non-deleterious reaction with the die material, (6) controlled reaction with the workpiece material, (7) easy application and removal, and (8) conformance with environmental standards. Most of these requirements are for elevated temperature considerations.

Experimental test techniques are described which allow several of the coating requirements to be determined. The techniques include the ring forging test and the separation-adhesion forging test. These two forging tests are performed on sets of die inserts which can be quickly interchanged so that contamination-free die surfaces are insured, Figure 5. Reactivity of the coating substance with the workpiece, Figure 6, and with the die material is determined through chemical compatibility tests which allow the depths of the reaction zones to be measured.

Standardized procedures for evaluation of separation-lubrication coatings for isothermal forging have not been adopted. But several important aspects must be considered and techniques for obtaining quantitative evaluation of these aspects are currently available. A summary of the important considerations for evaluating coating lubricants may be listed as:

1. Controlled ram speeds or strain rates are necessary to differentiate between equipment characteristics, material characteristics and coating characteristics when evaluating coating lubricants.

2. Controlled temperature die systems are essential to distinguish between material characteristics and interface characteristics.

3. Controlled die surfaces are necessary to distinguish between die roughness effects. Clean die surfaces are essential to avoid cross-contamination of the coating being evaluated with those coatings previously evaluated.

4. The use of the ring compression test can allow simultaneous determination of anti-friction effects of coatings and material flow stress effects during testing.

5. The use of a coating lubricant adhesion test allows the adhesion bond strength of the lubricant to the die to be determined. This property will allow die knock-out pins to be designed as needed.

6. The use of repeated adhesion tests or similiar type of repeated tests can allow the "build-up" of lubricant to be determined.

7. Chemical reactivity of the coating lubricants with the workpiece and with the dies can be assessed quantitatively by metallographic or microprobe techniques.

8. Film continuity of the coating lubricant can be determined by visual examination of the coating after time-temperature exposure typical of those expected in actual operation.

9. Ease of application and removal of the coating lubricants cannot yet be rated quantitatively but must be considered in overall lubricant evaluation.

10. Health factor and cost factor must also be considered in evaluation of suitable coating lubricants.

11. Chemical compositions, viscosity temperature relationships, wettability measurements and surface energy properties of lubricants are necessary to allow lubricants to be selected on the basis of fundamental properties.

D. Development of Separation-Lubrication Coating Substances for Isothermal Forging of Alpha-Beta Titanium Alloys[21]‡

A variety of workpiece and die coatings were developed and formulated to act as interface separation-lubrication substances at temperatures ranging between 1500°F and 1800°F. These were evaluated for their fusion and thermogravimetric stability, chemical compatibility with die materials, adhesion properties in shear and steady state film accumulation under conditions simulating those encountered in hot-die-isothermal or near-isothermal forging practice. Similar properties of several "state-of-technology" compositions were evaluated near a typical use temperature of 1650°F.

Comparison of the data characterizing the advanced compositions with the base-line provided by the prior formulations revealed that several new substances show superior properties and merit further examination by ring compression testing and later by prototype isothermal forging practice. Quantities of the most promising experimental separation-lubrication substances are to be scheduled for these evaluations.

Evaluation techniques for other factors such as ease of application and fusion behavior were also determined. Development and evaluation of these coatings were based on the idea of a forging system which included the workpiece coating, the die coating and the die material with consideration of heating times simulating actual operations. Die materials represented IN-100, TRW VIA Mod R and silicon nitride; preheat time ranged from one-half to four hours; and titanium alloys included both the alpha-beta Ti-6Al-4V and the beta stabilized "Beta C".

Advanced coatings representative of several new concepts of "vitreous binder plus particulate phase" formulations were developed. The new concepts included compositions containing boundary film additives, nucleating agents, and semi-abrasive particles. Die applied coatings evaluated were plasma sprayed stabilized zirconia, a nickel aluminide alloy, and a reaction bonded silicon coating.

E. Development of Separation-Lubrication Coating Substances for Isothermal Forging of Beta Titanium Alloys[22]*

A program to develop and formulate separation-lubrication compositions for

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‡ The text of this section is a slightly modified version of the original wording presented in Reference 21.

isothermal forging of beta titanium alloys in the temperature range from 1300°F to 1500°F was successfully completed. Several hundred compositions were chosen at the start of the program, mostly of the vitreous-phase-particulate type, containing boundary film additives or stable semi-abrasives. The field was narrowed to 28 low friction (LFC) types, 12 controlled friction (CFC) types and 8 molten salt (MSC) types. These were further evaluated through quantitative measurement of their application, fusion, stability, densification, accumulation and adhesion characteristics.

Optimum combinations of these factors were selected through a simplified multifactor desirability analysis and eight final compositions were selected for further evaluation of their friction reducing properties through ring compression forging at the hot die isothermal forging facility at Wright-Patterson Air Force Base. These compositions included three of the LFC type, one CFC type and one molten salt type for service at the low end of the temperature range (near 1350°F) on ferrous alloy dies, and three LFC type for service on nickel alloy dies at the high end of the thermal range (near 1500°F).

In general, interface control at these intermediate temperature levels involves several compromises. Generally, those vitreous ceramics that have sufficiently low viscosity to reduce friction significantly also contain elements that can cause pitting in titanium alloys or intergranular attack on nickel or iron base alloys. In the program, low viscosity in the LFC formulations was achieved according to a "forging window" concept with a lead oxide containing composition, a borosilicate-potassium glass and a high soda composition. It was anticipated that the relatively low service temperature would slow reaction rates to a degree that compatibility would not pose a problem. This did not prove to be the case however, as the sodium containing flux proved corrosive to both IN-100 and A-286.

F. Evaluation of Workpiece Coatings for Isothermal Forging of Titanium[23]

Experimental techniques for evaluating workpiece and die coatings for titanium isothermal coating applications developed earlier[19] were utilized to evaluate several experimental and commercial workpiece coatings. Results showed that the use of non-glassy coatings cause high interface friction, Figure 7., and non-uniform metal flow. Glassy coatings yield low interface friction surfaces and favorable metal flow, but also result in high adhesion bonds between the workpiece and the die. The adhesive bond strength is primarily influenced by the viscosity of the vitreous phase of the coating, Figure 8. Comparison with other results allows the effects of the particulate additions to be established.

The build-up of the coating on the die surface is shown to be an inverse function of the forging temperature, Figure 9. Techniques for predicting the maximum amount of build-up are discussed, Figure 10.

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* The text of this section is a slightly modified version of the original wording presented in Reference 22.

SECTION III

APPLIED METAL PROCESSING

The experience gained during the performance of the experimental programs outlined in Section II, combined with prior expertise and knowledge of metal forming, has been applied to the processing of more than 3600 billets and bars of experimental materials related to government alloy development programs. The processing included extrusion, conventional and isothermal forging, rolling, swaging and melting. All types of materials were processed during these studies, ranging from aluminum alloys to tungsten alloys. A variety of starting material forms, cast, powder and wrought conditions were included in the processing operations. A number of heat treatment operations were also performed in these application studies.

A listing of the billets processed by extrusion for these applications studies are included in Table 2, together with the deformation pressure for the particular processing conditions and a description of the product quality.

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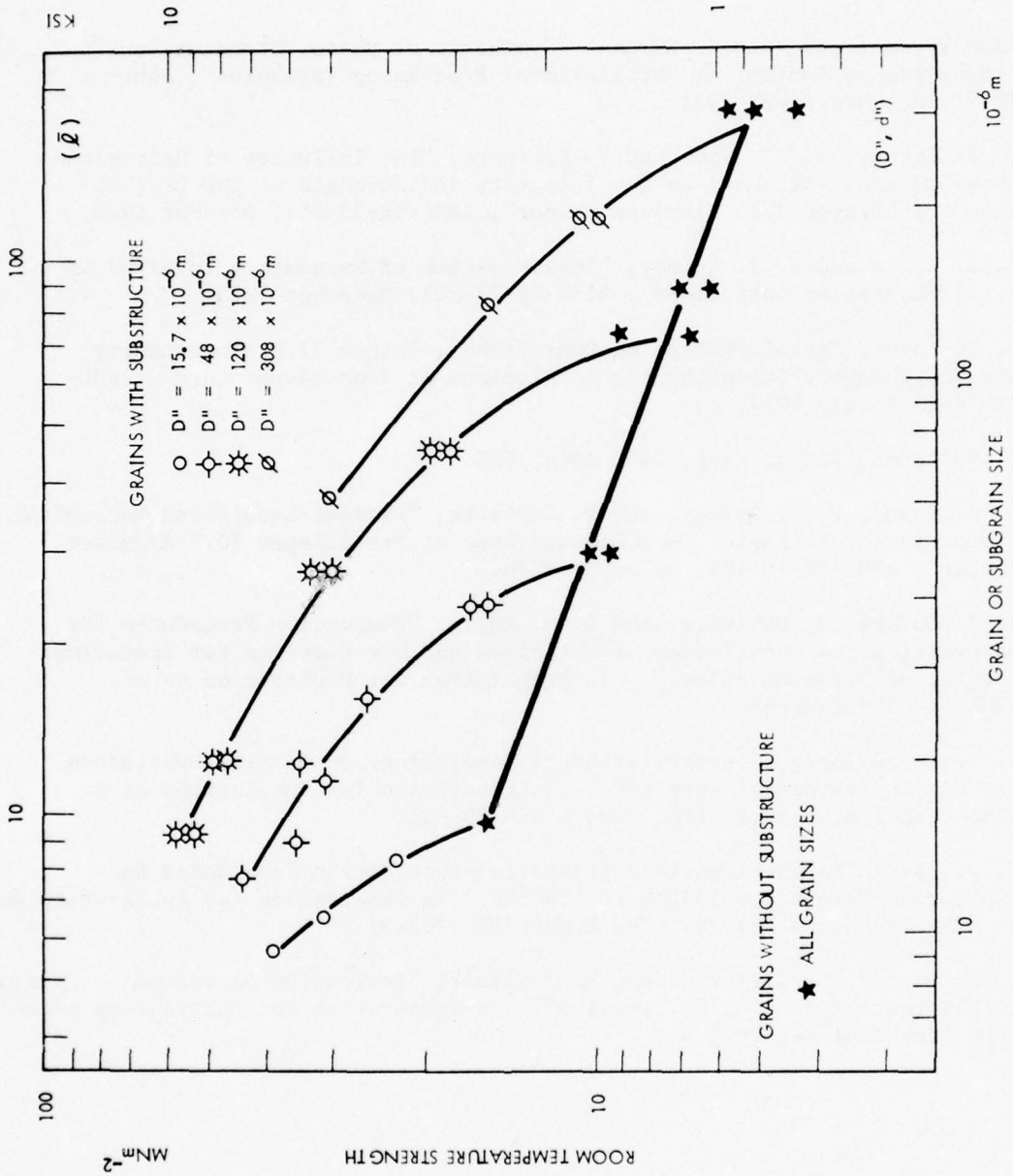

Figure 1. Original room temperature strength vs. "grain diameter" or "sub-grain diameter" data for aluminum, after Hultgren[18], for comparison with Fig. 2. Note that the slope of the line for the grain boundary data is not -1/2 because the Hall-Petch friction stress has not been subtracted out. Also, the slope of the lines for the sub-boundary data varies with sub-grain size, largely because the density of grain boundaries has not been subtracted out.

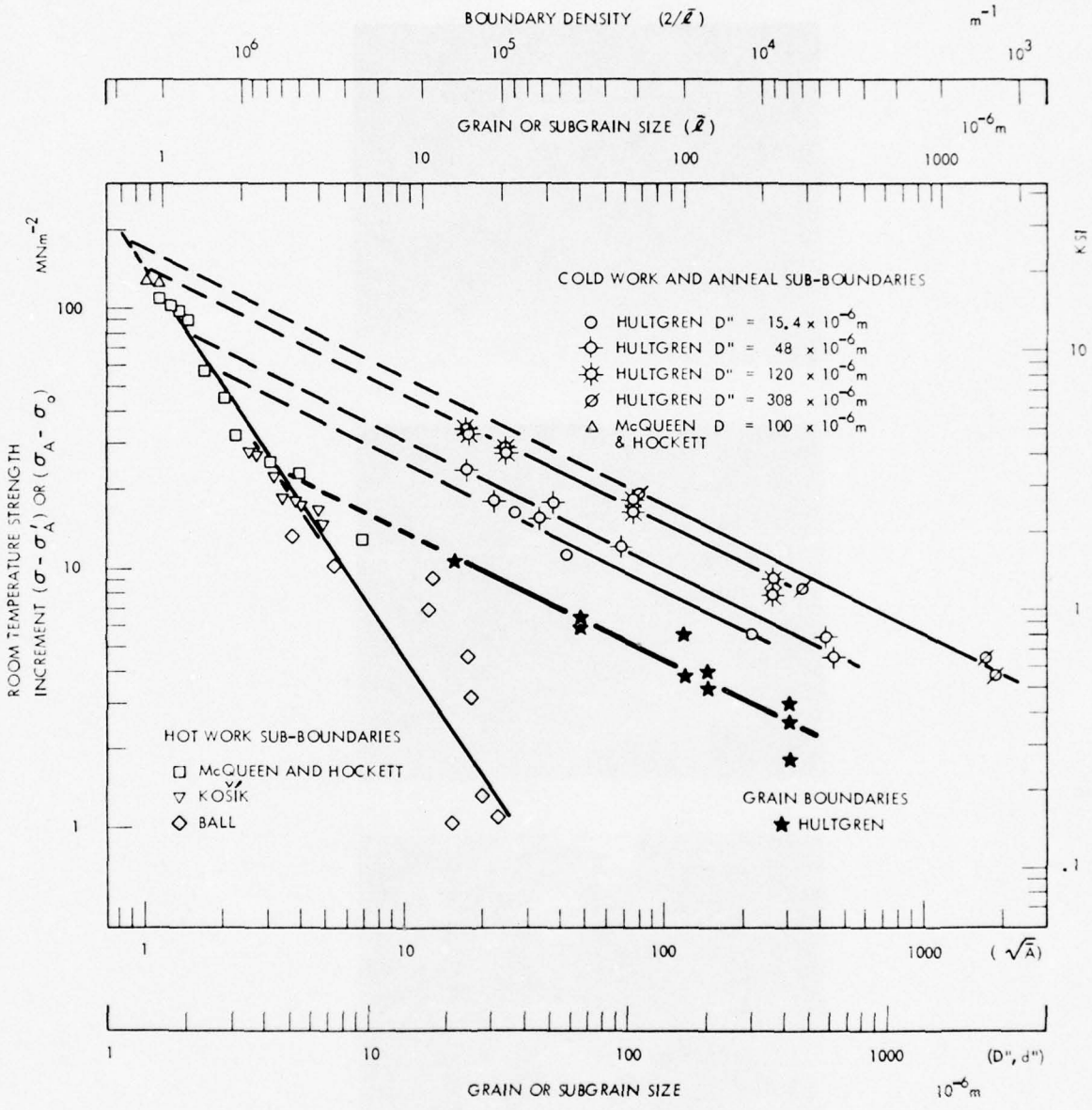

Figure 2. Comparison of the contribution to the room temperature strength of aluminum for grain boundaries, hot work sub-boundaries and cold work and anneal sub-boundaries.

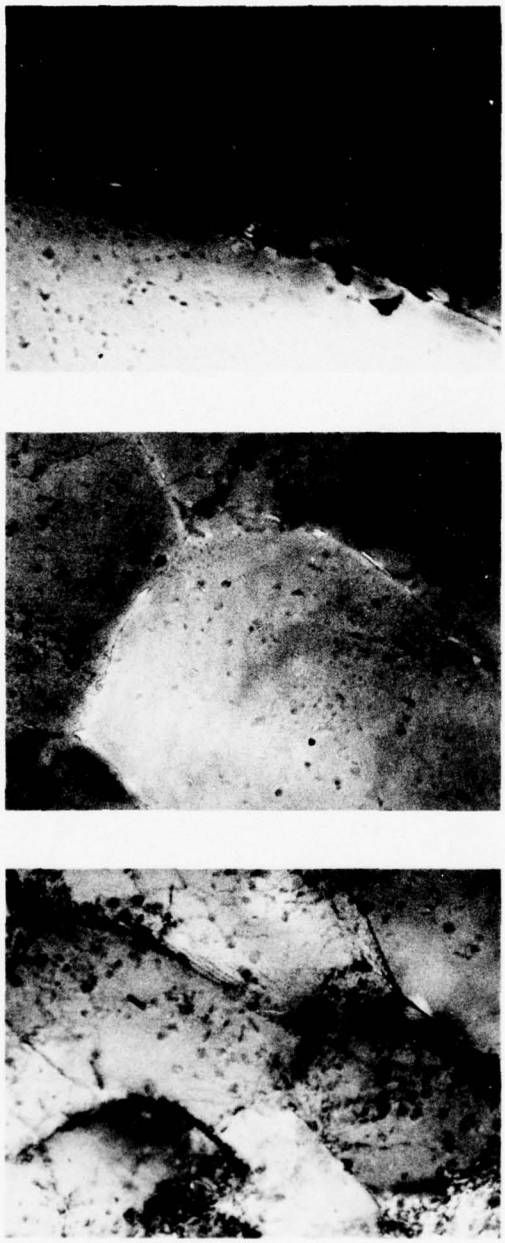

Figure 3. Electron micrograph of prior consolidated powder product after extrusion at a reduction ratio of 20:1 followed by a T6 heat treatment. (a) Note the presence of both a uniform distribution of $\doteq 0.05 \times 10^{-6}$m E-Phase precipitates and a powder particle boundary, (b) Recrystallized region containing fine equiaxed grains which are free of substructure, (c) Non-recrystallized region containing a hot work substructure.

X24000

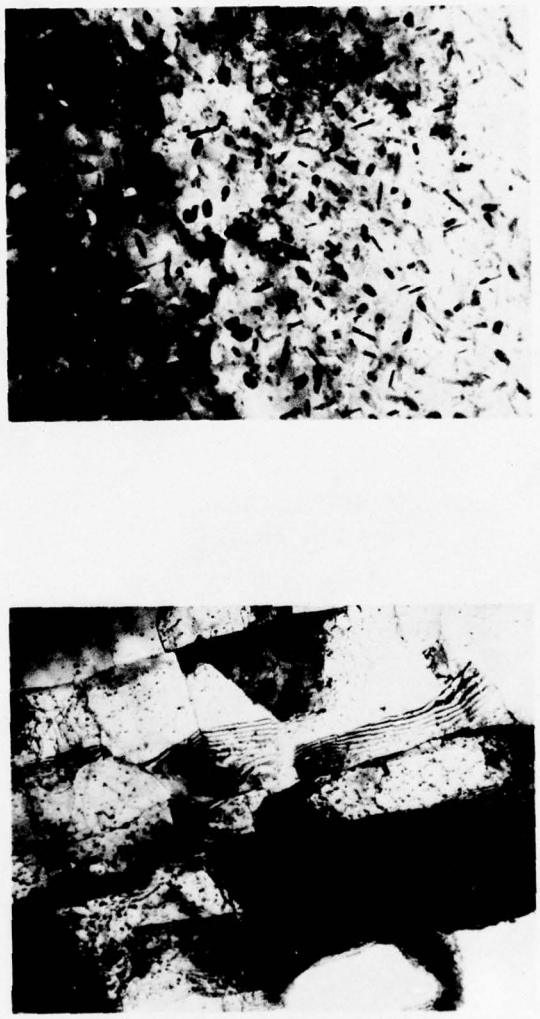

Figure 4. Electron micrograph of the ingot product extruded at a 20:1 reduction ratio after a 2 hour - 800°F (700°K) preheat. (a) In the as-extruded condition, showing profuse precipitation of laths of η $MgZn_2$, (b) In, X8200
the T6 heat treated condition showing the presence of a uniform substructure and a uniform distribution of the E-Phase precipitates. X6000

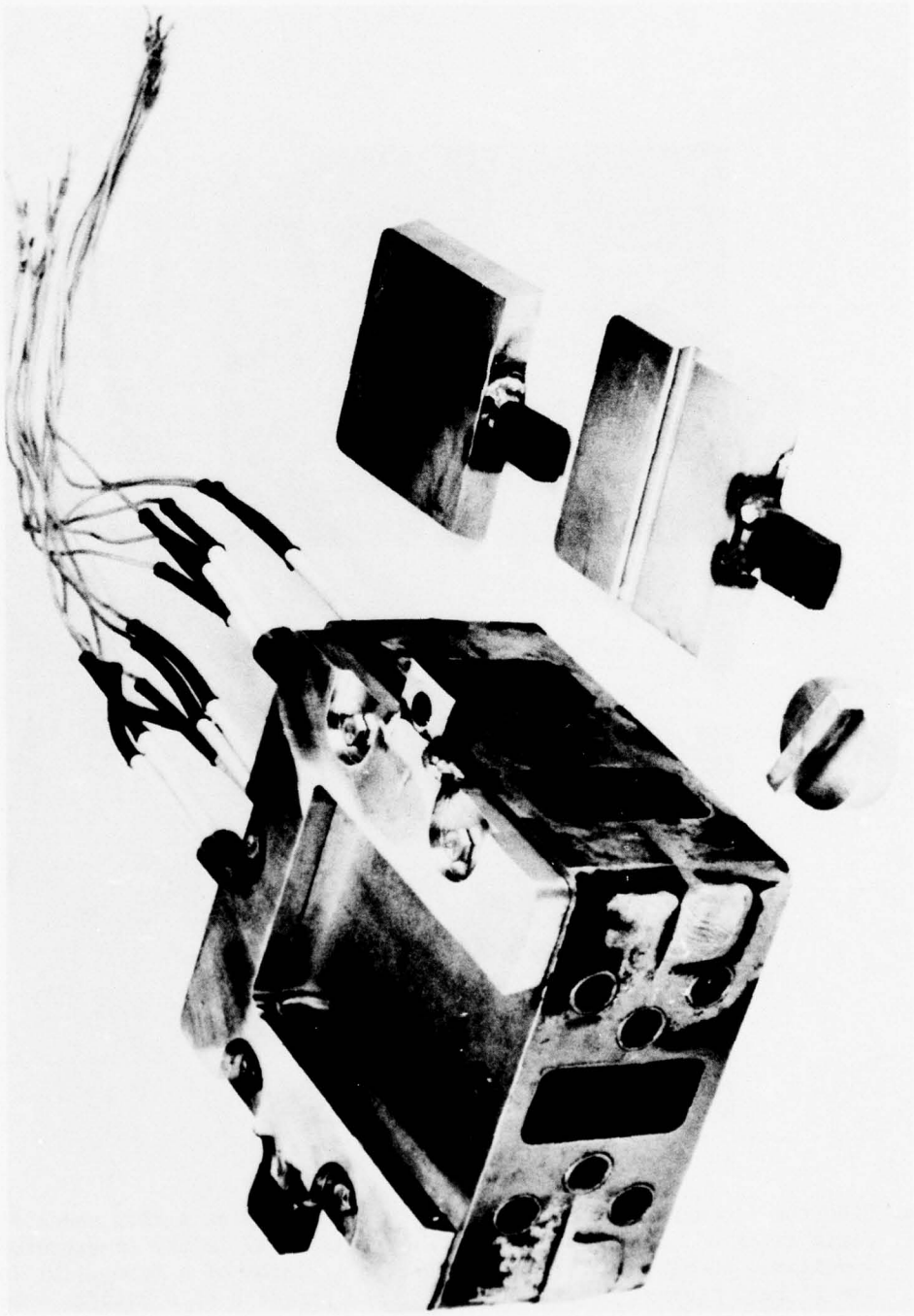

Figure 5. Lay-out assembly of the heated die backer, die holder, the two types of interchangeable dies used in the analysis and the coating adhesion specimen used in the analysis of separation-lubrication substances for titanium isothermal forging operations.

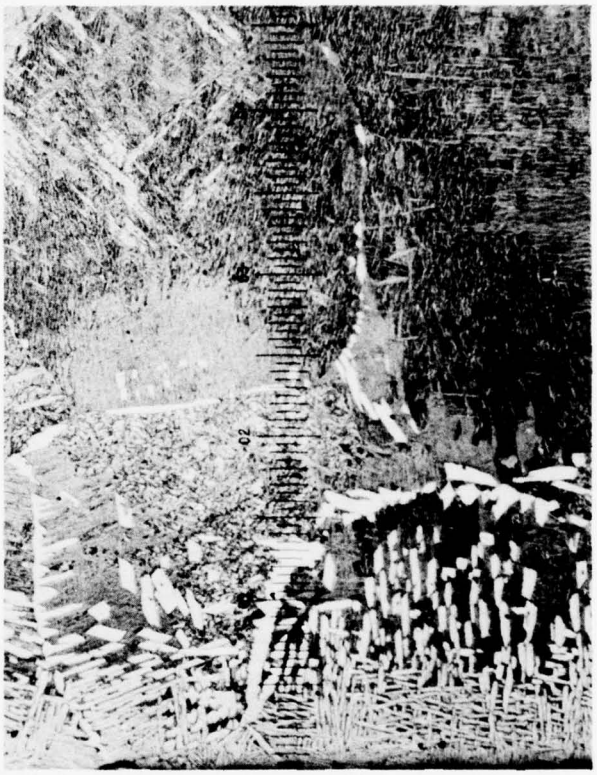

Figure 6. Reaction zone between a glassy workpiece coating and Ti-6Al-4V workpiece after exposure for five hours at 1800°F.

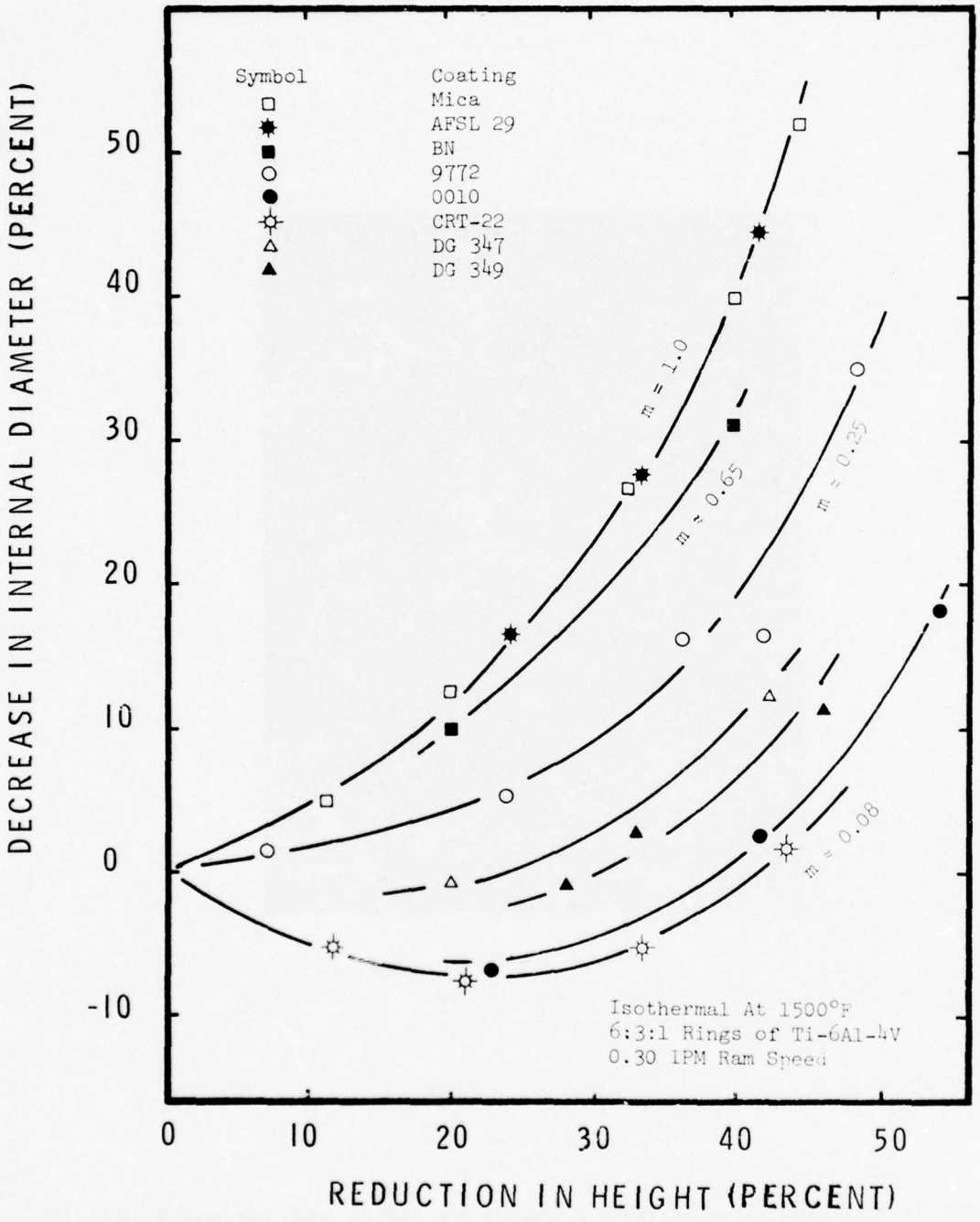

Figure 7. Effects of glassy and non-glassy coatings on friction.

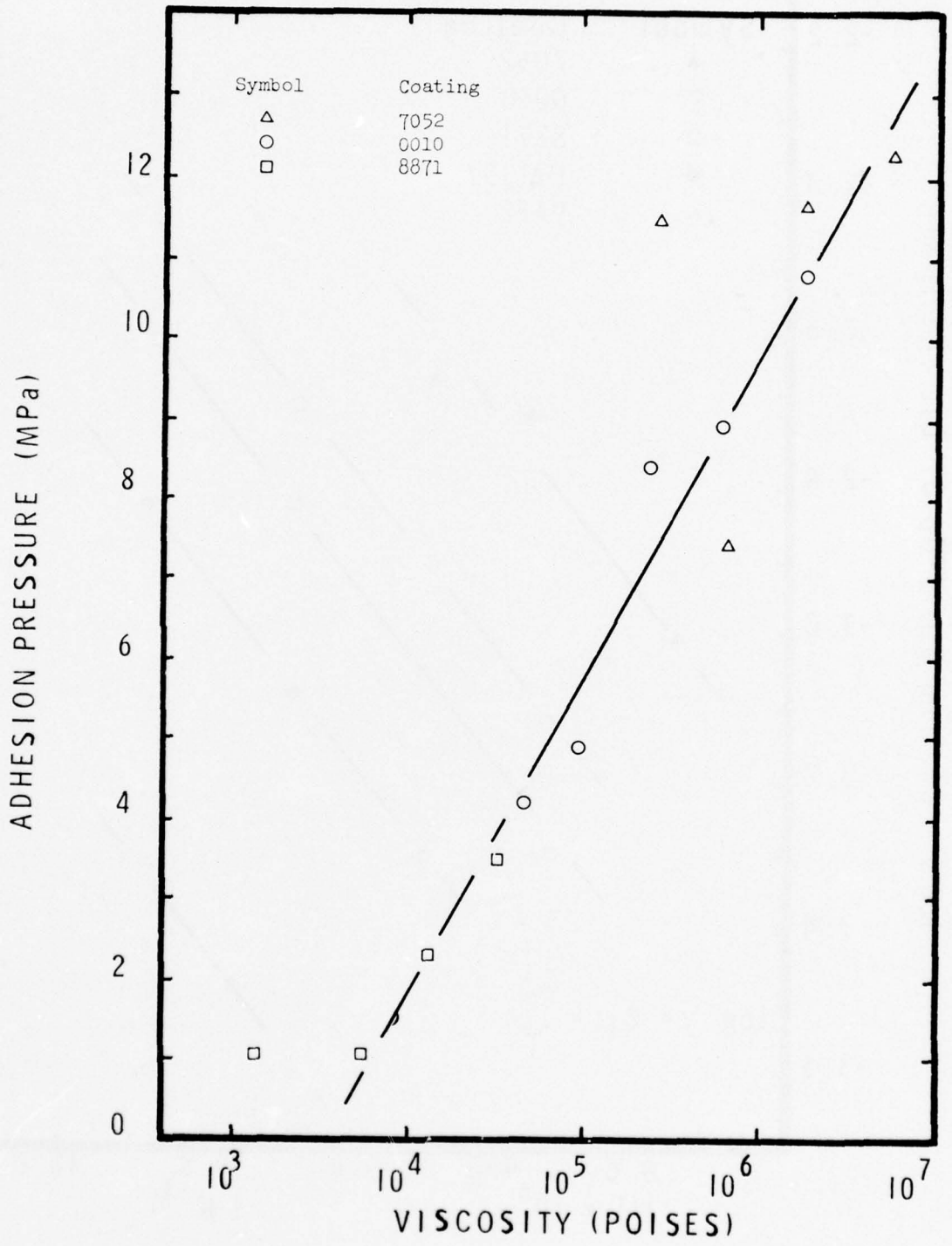

Figure 8. Relation of die adhesion to viscosity.

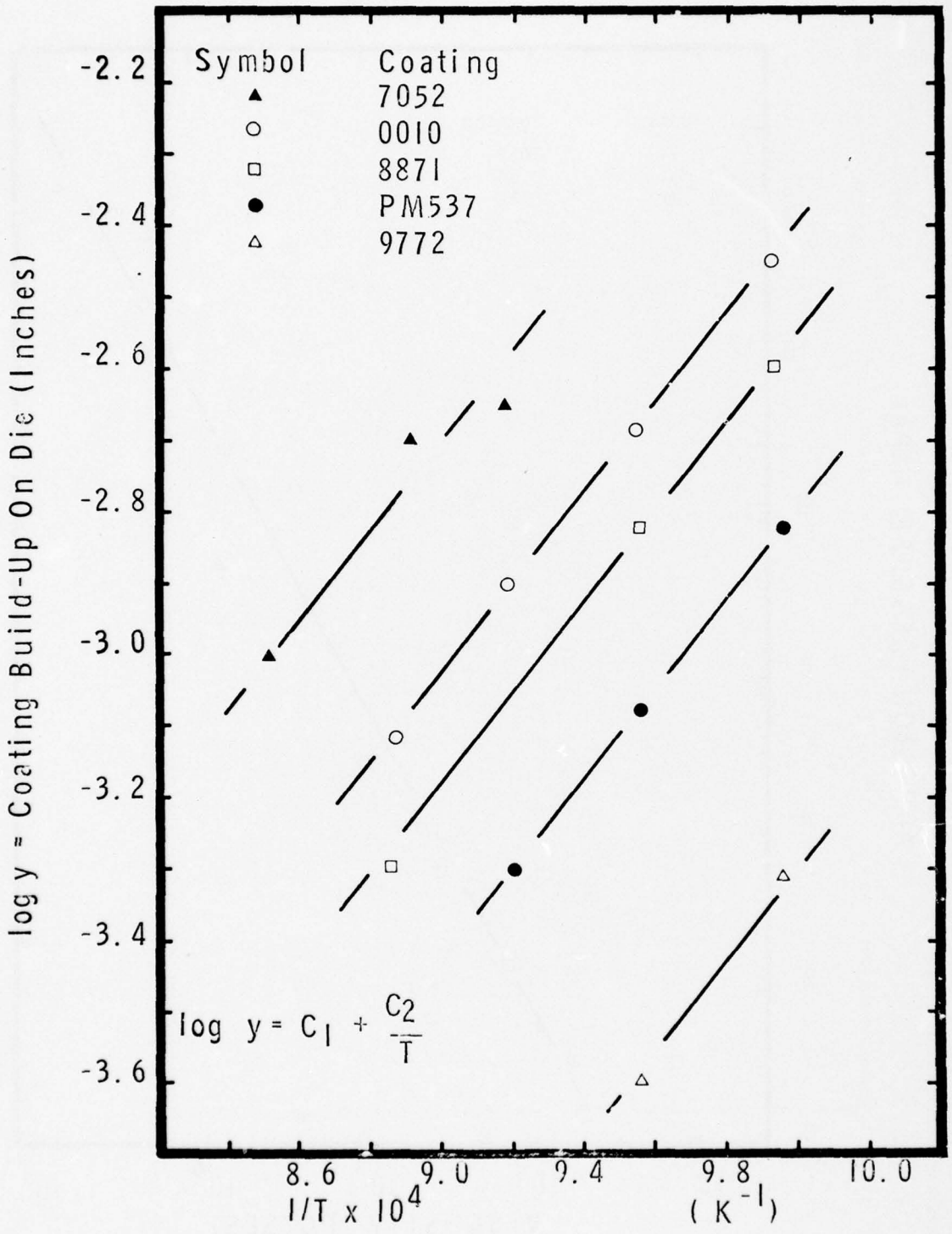

Figure 9. Temperature effects on coating adhesion.

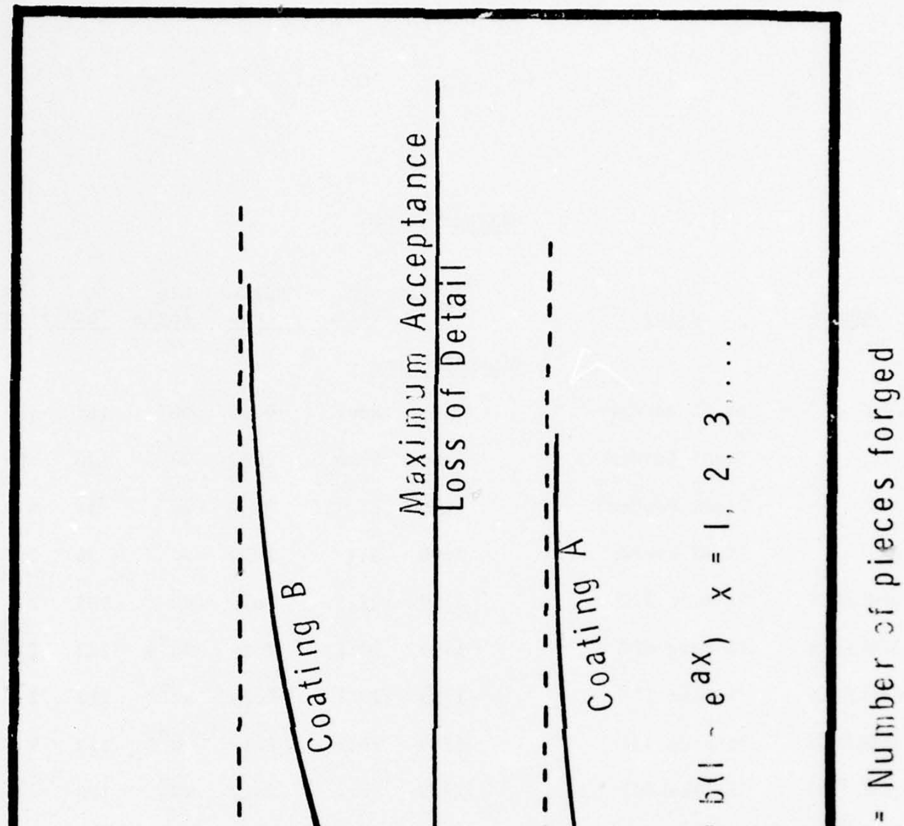

Figure 10. Techniques for predicting effects of maximum build-up during a production run.

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
5420	ARL	Ti-Al Powder	2400	None	0010	90°	181	.5	Good
5421	ARL	Ti-Al Powder	2600	None	7052	90°	178	.5	Good
5422	ARL	Ti-Al Powder	2600	15.9:1	7052	90°	58	3.0	Good
5423	ARL	Ti-Al Powder	2600	9:1	7052	90°	36	3.0	Good
5447	AFML/LLM	Ti-Beta III	1750	28:1	Poly	90	132	2.5	Good
5448	AFML/LLM	Ti-Beta III	1750	30:1	Poly	90°R	123	2.8	Good
5449	AFML/LLM	Ti-Beta III	1750	30:1	Poly	90°R	113	2.8	Good
5450	AFML/LLM	Ti-Beta III	1750	19:1	Poly	90°R	147	2.6	Good
5451	AFML/LLM	Ti-Beta III	1750	28:1	Poly	90°	122	2.5	Good
5452	AFML/LLM	Ti-Beta III	1750	28:1	Poly	90°	119	2.6	Good
5475	ARL	Ti-Al-Y_2O_3	2575	12.7:1	7052	90°	57	1.9	Good
5482	AFML/LLM	Ti-6-2-4-6 Powder	1650	None	Poly	90°	184	---	Good
5483	AFML/LLM	Ti-6-2-4-6 Powder	1650	None	Poly	90°	184	1.0	Good
5484	AFML/LLM	Ti-6-2-4-6 Powder	1650	None	Poly	90°	178	.8	Good
5485	AFML/LLM	Ti-6-2-4-6 Powder	1650	None	Poly	90°	---	---	Good
5486	AFML/LLM	Ti-6-2-4-6 Powder	1400	None	Poly	90°	173	1.0	Good
5487	AFML/LLM	Ti-6-2-4-6 Powder	1400	None	Poly	90°	189	1.0	Good
5488	AFML/LLM	Ti-6-2-4-6 Powder	1400	None	Poly	90°	184	1.0	Good
5489	AFML/LLM	Ti-6-2-4-6 Powder	1650	10:1	Poly	90°	124	1.9	Good
5490	AFML/LLM	Ti-6-2-4-6 Powder	1650	10:1	Poly	90°	116	1.8	Good
5491	AFML/LLM	Ti-6-2-4-6 Powder	1650	10:1	Poly	90°	111	2.0	Good
5492	AFML/LLM	Ti-6-2-4-6 Powder	1650	10:1	Poly	90°	119	1.9	Good
5493	Polyt.Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.3	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
5494	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.3	Good
5495	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.1	Good
5496	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.0	Good
5497	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	3.2	Good
5498	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	3.0	Good
5499	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	89	3.1	Good
5500	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	88	3.1	Good
5501	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	89	3.0	Good
5502	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.0	Good
5503	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	3.0	Good
5504	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	3.1	Good
5505	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	3.0	Good
5506	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	3.0	Good
5507	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	90	3.0	Good
5508	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	89	3.0	Good
5509	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	92	3.0	Good
5510	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	3.0	Good
5511	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	89	3.0	Good
5523	ARL	Ti-Al	2575	26:1	7810	90°	70	2.0	Poor
5524	ARL	Ti-Al	2575	16:1	7810	90°	70	2.5	Fair
5525	ARL	Ti_3Al	2200	26:1	0010	90°	51	3.0	Good
5526	ARL	Ti_3Al	2200	26:1	0010	90°	46	3.1	Good
5527	AFML/LLM	Ti-6-2-4-6	1800	10:1	Poly	90°	97	2.0	Good
5528	AFML/LLM	Ti-6-2-4-6	1800	10:1	Poly	90°	95	2.0	Good
5529	AFML/LLM	Ti-6-2-4-6	1800	10:1	Poly	90°	82	2.1	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
5530	AFML/LLS	Ti_3Al	2200	None	0010	90°	178	0.5	Good
5531	AFML/LLS	Ti_3Al	2200	None	0010	90°	181	0.5	Good
5532	AFML/LLS	Ti_3Al	2200	None	0010	90°	184	0.5	Good
5533	AFML/LLS	Ti_3Al	2200	None	0010	90°	186	0.5	Good
5534	AFML/LLS	Ti_3Al	2200	None	0010	90°	186	0.5	Good
5535	AFML/LLS	Ti_3Al	2200	None	0010	90°	180	0.5	Good
5536	AFML/LLS	Ti_3Al	2200	None	0010	90°	165	0.5	Good
5537	AFML/LLS	Ti_3Al	2200	None	0010	90°	184	0.5	Good
5538	AFML/LLS	Ti_3Al	2200	None	0010	90°	182	0.5	Good
5539	AFML/LLS	Ti_3Al	2200	None	0010	90°	175	0.5	Good
5540	ARL	Ti-Al Powder	2600	None	7740	90°	175	1.0	Good
5541	ARL	Ti-Al Powder	2575	None	7740	90°	178	1.0	Good
5568	ARL	Ti-Al Powder	2575	12:1	7740	90°	65	3.5	Good
5569	ARL	Ti-Al Powder	2575	12:1	7740	90°	70	3.5	Good
5595	P & W	Ti-36Al	2400	6.1:1	0010	60°	35	2.5	Good
5596	P & W	Ti-36Al	2400	6.3:1	0010	60°	39	2.5	Good
5597	P & W	Ti-36Al	2400	6.4:1	0010	60°	43	2.5	Good
5625	AFML/LLM	Ti-Beta III Powder	1750	4:1	Poly	90° sq	81	3.4	Good
5626	AFML/LLM	Ti-Beta III Powder	1750	6:1	Poly	90° sq	77	3.0	Good
5627	AFML/LLM	Ti-Beta III Powder	1750	10:1	Poly	90° sq	95	3.0	Good
5628	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	184	1.0	Good
5629	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	184	1.0	Good
5630	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	186	1.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
5631	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	184	1.0	Good
5632	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	186	1.0	Good
5633	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	189	1.0	Good
5634	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	189	1.0	Good
5635	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	188	1.0	Good
5636	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	189	1.0	Good
5637	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	189	1.0	Good
5638	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	186	1.0	Good
5639	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	189	1.0	Good
5640	AFML/LLS	Ti-6Al-2Sn-4Zr-2Mo	1600	20:1	0010	90°	175	1.4	Good
5641	AFML/LLS	Ti-6Al-2Sn-4Zr-2Mo	1600	20:1	0010	90°	155	1.7	Good
5642	AFML/LLM	Ti-Beta III Powder	1750	4:1	0010	90°sq	70	2.1	Good
5643	AFML/LLM	Ti-Beta III Powder	1750	6:1	0010	90°sq	90	2.1	Good
5644	AFML/LLM	Ti-Beta III Powder	1750	10:1	0010	90°sq	100	2.0	Good
5645	AFML/LLM	Ti-Beta III Powder	1750	4:1	Poly	90°sq	65	2.1	Good
5646	AFML/LLM	Ti-Beta III Powder	1750	4:1	Poly	90°sq	61	2.0	Good
5647	AFML/LLM	Ti-Beta III Powder	1750	6:1	Poly	90°sq	85	2.0	Good
5648	AFML/LLM	Ti-Beta III Powder	1750	6:1	Poly	90°sq	80	2.0	Good
5649	AFML/LLM	Ti-Beta III Powder	1750	10:1	Poly	90°sq	100	2.0	Good
5650	AFML/LLM	Ti-Beta III Powder	1750	10:1	Poly	90°sq	97	2.0	Good
5651	AFML/LLM	Ti-Beta III Powder	1400	4:1	8871	90°sq	111	2.0	Good
5652	AFML/LLM	Ti-Beta III Powder	1400	4:1	Poly	90°sq	100	2.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
5653	AFML/LLM	Ti-Beta III Powder	1400	4:1	Poly	90°sq	86	2.3	Good
5654	AFML/LLM	Ti-Beta III Powder	1400	6:1	8871	90°sq	128	1.9	Good
5655	AFML/LLM	Ti-Beta III Powder	1400	6:1	Poly	90°sq	97	1.9	Good
5656	AFML/LLM	Ti-Beta III Powder	1400	6:1	Poly	90°sq	107	1.9	Good
5657	AFML/LLM	Ti-Beta III Powder	1400	10:1	8871	90°sq	143	1.7	Good
5658	AFML/LLM	Ti-Beta III Powder	1400	10:1	8871	90°sq	119	1.8	Good
5659	AFML/LLM	Ti-Beta III Powder	1400	10:1	Poly	90°sq	122	1.7	Good
5660	AFML/LLM	Ti-Beta III Powder	1400	10:1	Poly	90°sq	124	1.7	Good
5668	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	189	1.0	Good
5669	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	190	1.0	Good
5670	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	189	1.0	Good
5671	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	189	1.0	Good
5672	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	190	1.0	Good
5673	AFML/LLM	Ti-6-6-2 Powder	1550	None	Poly	90°	190	1.0	Good
5674	AFML/LLM	Ti-6-6-2	1550	3:1	Poly	90°	68	2.2	Good
5675	AFML/LLM	Ti-6-6-2	1550	3:1	Poly	90°	59	2.2	Good
5676	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	90°	86	2.1	Good
5677	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	90°	103	2.1	Good
5678	AFML/LLM	Ti-6-6-2	1550	7:1	Poly	90°	95	2.2	Good
5679	AFML/LLM	Ti-6-6-2	1550	6.9:1	Poly	90°	92	2.1	Good
5680	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	189	1.0	Good
5681	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	184	1.0	Good
5682	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	192	1.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
5683	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	190	1.0	Good
5684	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	190	1.0	Good
5685	AFML/LLM	Ti-6-6-2 Powder	1650	None	Poly	90°	186	1.0	Good
5686	AFML/LLM	Ti-6-6-2	1650	3:1	Poly	90°	57	2.2	Good
5687	AFML/LLM	Ti-6-6-2	1650	3:1	Poly	90°	54	2.2	Good
5688	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	78	2.1	Good
5689	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	76	2.1	Good
5690	AFML/LLM	Ti-6-6-2	1650	7:1	Poly	90°	86	2.2	Good
5691	AFML/LLM	Ti-6-6-2	1650	7:1	Poly	90°	95	2.1	Good
5692	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	185	1.0	Good
5693	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	186	1.0	Good
5694	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	188	1.0	Good
5695	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	184	1.0	Good
5696	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	189	1.0	Good
5697	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	188	1.0	Good
5698	AFML/LLM	Ti-6-6-2	1750	3:1	Poly	90°	54	2.2	Good
5699	AFML/LLM	Ti-6-6-2	1750	3:1	Poly	90°	54	2.2	Good
5700	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	90°	66	2.1	Good
5701	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	90°	66	2.1	Good
5702	AFML/LLM	Ti-6-6-2	1750	7:1	Poly	90°	80	2.1	Good
5703	AFML/LLM	Ti-6-6-2	1750	7:1	Poly	90°	78	2.1	Good
5704	AFML/LLS	Ti-15.8Al	2200	19.2:1	0010	90°	43	3.6	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Titanium Base							
5705	AFML/LLS	Ti-15.6Al-1Zr	2200	19.2:1	0010	90°	43	3.5	Good
5706	AFML/LLS	Ti-15.5Al-2Zr	2200	19.2:1	0010	90°	43	3.5	Good
5707	AFML/LLS	Ti-15.2Al-4Zr	2200	19.2:1	0010	90°	49	3.5	Good
5708	AFML/LLS	Ti-14.9Al-6Zr	2200	19.2:1	0010	90°	54	3.5	Good
5709	AFML/LLS	Ti-14.6Al-8Zr	2200	19.2:1	0010	90°	59	3.5	Good
5710	AFML/LLS	Ti-12.7Al-9Sn	2200	19.2:1	0010	90°	76	3.4	Good
5711	AFML/LLS	Ti-9.5Al-18.1Sn	2200	19.2:1	0010	90°	159	2.4	Good
5712	AFML/LLS	Ti-6.3Al-27.1Sn	2200	19.2:1	0010	90°	178	0.3	Good
5713	AFML/LLS	Ti-4.8Al-31.7Sn	2200	19.2:1	0010	90°	177	0.6	Fair
5714	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo+	2200	9.25:1	0010	90°	38	3.5	Good
5715	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo+	2200	9.25:1	0010	90°	39	3.5	Good
5716	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo+	2200	9.25:1	0010	90°	38	3.5	Good
5724	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	95	2.0	Good
5725	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	97	2.0	Good
5726	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	181	1.0	Good
5727	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	184	1.0	Good
5728	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	186	1.0	Good
5729	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	189	1.0	Good
5730	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	184	1.0	Good
5731	AFML/LLM	Ti-Beta III	1750	Blank	Poly	90°	186	1.0	Good
5732	AFML/LLM	Ti-Beta III	1400	4:1	Poly	90°sq	81	2.1	Good
5733	AFML/LLM	Ti-Beta III	1400	6:1	Poly	90°sq	100	2.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
5734	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	130	1.7	Good
5735	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	130	1.7	Good
5736	AFML/LLM	Ti-Beta III	1400	Blank	Poly	90°	186	1.0	Good
5737	AFML/LLM	Ti-Beta III	1400	Blank	Poly	90°	189	1.0	Good
5738	AFML/LLM	Ti-Beta III	1400	Blank	Poly	90°	186	1.8	Good
5739	AFML/LLM	Ti-Beta III	1400	Blank	Poly	90°	189	1.8	Good
5740	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	119	1.8	Good
5741	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	124	1.7	Good
5742	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	116	1.9	Good
5743	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°sq	115	1.9	Good
5744	AFML/LLM	Ti-Beta III	1400	10:1	8871	90°sq	108	1.9	Good
5745	AFML/LLM	Ti-Beta III	1400	10:1	8871	90°sq	111	1.9	Good
5746	P & W	Ti-36Al	2250	Blank	7052		184	1.0	Good
5747	P & W	Ti-36Al	2350	Blank	7052		184	1.0	Good
5748	P & W	Ti-36Al	2350	Blank	7052		184		Good
5749	P & W	Ti-36Al	2300	Blank	7052		184		Good
5750	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	92	2.2	Good
5751	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	92	2.1	Good
5752	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	95	2.1	Good
5753	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°sq	95	2.0	Good
5754	AFML/LLM	Ti-Beta III	1750	10:1	0010	90°sq	111	2.1	Good
5755	AFML/LLM	Ti-Beta III	1750	10:1	0010	90°sq	109	2.1	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
5773	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	189	1.0	Good
5774	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	189	1.0	Good
5775	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	188	1.0	Good
5776	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	189	1.0	Good
5777	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	186	1.0	Good
5778	AFML/LLM	Ti-6-6-2 Powder	1550	Blank	Poly	90°	189	1.0	Good
5779	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	60°	107	2.2	Good
5780	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	60°	89	2.2	Good
5781	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	90°	95	2.1	Good
5782	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	90°	84	2.1	Good
5783	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	120°	97	2.1	Good
5784	AFML/LLM	Ti-6-6-2	1550	5:1	Poly	120°	92	2.1	Good
5805	AFML/LLM	Ti-6-6-2 Powder	1650	Blank	Poly	90°	181	1.0	Good
5806	AFML/LLM	Ti-6-6-2 Powder	1650	Blank	Poly	90°	192	1.0	Good
5807	AFML/LLM	Ti-6-6-2 Powder	1650	Blank	Poly	90°	189	1.0	Good
5808	AFML/LLM	Ti-6-6-2 Powder	1650	Blank	Poly	90°	188	1.0	Good
5809	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	76	2.2	Good
5810	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	84	2.1	Good
5811	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	76	2.2	Good
5812	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	76	2.1	Good
5813	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	92	2.1	Good
5814	AFML/LLM	Ti-6-6-2	1650	5:1	Poly	90°	92	2.1	Good
5815	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	181	1.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
5816	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	178	1.0	Good
5817	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	184	1.0	Good
5818	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	184	1.0	Good
5819	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	184	1.0	Good
5820	AFML/LLM	Ti-6-6-2 Powder	1750	Blank	Poly	90°	184	1.0	Good
5821	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	60°	68	2.3	Good
5822	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	60°	65	2.2	Good
5823	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	90°	73	2.1	Good
5824	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	90°	69	2.2	Good
5825	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	120°	69	2.2	Good
5826	AFML/LLM	Ti-6-6-2	1750	5:1	Poly	120°	61	2.2	Good
5837	ARL	Ti-15.5w/o-Al	2200	11.15:1	0010	90°	43	3.1	Good
5838	ARL	Ti-16w/o-Al	2200	11.15:1	0010	90°	49	3.5	Good
5839	ARL	Ti-36w/o-Al	2400	11.15:1	7052	90°	76	3.0	Good
5840	ARL	Ti-36w/o-Al+5Nb	2400	11.15:1	7052	90°	95	3.0	Good
5841	ARL	Ti-40w/o-Al	2600	11.15:1	7052	90°	76	3.5	Good
5854	AFML/LLM	Ti-Beta III Powder	1400	10:1	Poly	90°	113	1.7	Good
5855	AFML/LLM	Ti-Beta III Powder	1750	10:1	Poly	90°	86	2.0	Good
5856	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	170	1.0	Good
5857	AFML/LLM	Ti-Beta III Powder	1400	Blank	Poly	90°	173	1.0	Good
5858	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	178	1.0	Good
5859	AFML/LLM	Ti-Beta III Powder	1750	Blank	Poly	90°	181	1.0	Good
5860	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°	107	1.8	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
5861	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°	108	1.9	Good
5862	AFML/LLM	Ti-Beta III	1400	10:1	Poly	90°	84	2.0	Good
5863	AFML/LLM	Ti-Beta III	1750	10:1	Poly	90°	113	2.0	Good
5864	AFML/LLS	Ti-8Al-2Sn-12Zr-1Mo+	1750	26:1	Poly	90°	89	2.7	Good
5874	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	86	2.8	Good
5875	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	81	2.8	Good
5876	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	73	2.7	Good
5877	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	78	2.7	Good
5878	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	78	2.7	Good
5879	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	78	2.7	Good
5880	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	70	2.7	Good
5881	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	70	2.7	Good
5882	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	77	2.7	Good
5883	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	73	2.7	Good
5892	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	175	1.0	Good
5893	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	181	1.0	Good
5894	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	173	1.0	Good
5895	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	173	1.0	Good
5896	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	96	2.0	Good
5897	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	81	2.0	Good
5898	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	103	1.9	Good
5899	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	84	2.0	Good
5900	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	173	1.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
5901	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	173	1.0	Good
5902	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	175	1.0	Good
5903	AFML/LLM	Ti-6-6-2	1650	Blank	Poly	90°	178	1.0	Good
5904	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	111	2.0	Good
5905	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	85	2.0	Good
5906	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	103	1.9	Good
5907	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	88	2.0	Good
5908	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	99	1.9	Good
5909	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	65	2.1	Good
5910	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	103	1.8	Good
5911	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	65	2.0	Good
5912	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	108	1.8	Good
5913	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	62	2.1	Good
5914	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	99	1.9	Good
5915	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	65	2.0	Good
5916	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	76	2.0	Good
5917	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	54	2.3	Good
5918	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	84	2.0	Good
5919	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	70	2.0	Good
5920	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	81	2.0	Good
5921	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	59	2.0	Good
5922	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	81	1.9	Good
5923	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	59	2.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
5924	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	178	1.0	Good
5925	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	178	1.0	Good
5926	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5927	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	178	1.0	Good
5928	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	181	1.0	Good
5929	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	181	1.0	Good
5930	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	181	1.0	Good
5931	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5932	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5933	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	178	1.0	Good
5934	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	186	1.0	Good
5935	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	181	1.0	Good
5936	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5937	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5938	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	186	1.0	Good
5939	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
5940	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	77	2.0	Good
5941	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	49	2.2	Good
5942	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	76	2.0	Good
5943	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	49	2.0	Good
5944	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	76	2.0	Good
5945	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°	46	2.0	Good
5946	AFML/LLM	Ti-6-6-2	1850	10:1	Poly	90°	86	2.1	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
5947	AFML/LLM	Ti-6-6-2	1850	4:1	Poly	90°sq	55	2.0	Good
5948	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	117	1.9	Good
5949	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	73	2.0	Good
5950	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	109	1.9	Good
5951	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	70	2.0	Good
5952	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	113	1.8	Good
5953	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	69	2.0	Good
5954	AFML/LLM	Ti-6-6-2	1650	10:1	Poly	90°	112	1.9	Good
5955	AFML/LLM	Ti-6-6-2	1650	4:1	Poly	90°sq	80	2.0	Good
5956	ARL	CP-Ti-Ti Powder	2575	16.7:1	7740	90°	43	2.0	Poor
5957	ARL	CP-Ti-Ti-Al	2575	16:1	7740	90°	32	2.3	Poor
5958	ARL	CP-Ti-Ti-Al	2575	16:1	7740	90°	32	2.1	Fair
5959	ARL	CP-Ti-Ti-Al	2575	20:1	7740	90°	32	2.1	Good
5960	ARL	CP-Ti-Ti-Al	2575	20:1	7740	90°	32	2.0	Fair
5961	ARL	Ti-Al Powder	2575	16:1	7740	90°	54	2.0	Good
5962	ARL	Ti-Al Powder	2575	20:1	7740	90°	59	2.0	Good
5963	ARL	Ti-Al Powder	2575	26:1	7740	90°	59	2.0	Good
6000	AFML/LLM	Ti-6-6-2	1850	Blank	Poly	90°	184	1.0	Good
6009	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo+	1700	15.2:1	0010	90°	107	1.9	Good
6017	AFML/LLM	Ti-5Al-5Sn-2Zr+	1600	15.6:1	0010	60°	158	2.2	Good
6020	AFML/LLM	Ti-6-6-2	1650	15:1	0010	90°	104	2.5	Good
6038	AFML/LLM	Ti-6-4	1650	Bare	Poly	90°	188	1.0	Good
6039	AFML/LLM	Ti-6-4	1650	Bare	Poly	90°	186	1.0	Good

Sq - Square

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
6040	AFML/LLM	Ti-6-4	1800	Bare	Poly	90°	189	1.0	Good
6041	AFML/LLM	Ti-6-4	1800	Bare	Poly	90°	186	1.0	Good
6044	AFML/LLM	Ti-6-4	1650	16:1	Poly	90°	126	3.0	Good
6045	AFML/LLM	Ti-6-4	1650	16:1	Poly	90°	124	1.7	Good
6046	AFML/LLM	Ti-6-4	1800	16:1	Poly	90°	92	1.8	Good
6047	AFML/LLM	Ti-6-4	1800	16:1	Poly	90°	95	1.7	Good
6074	AFML/LLM	Ti-5Al-5Sn-2Zr-2Mo+	1600	6.2:1	0010	90°	124	2.9	Good
6090	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	60°	22	2.9	Good
6091	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	60°	32	2.9	Good
6092	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	60°	38	2.9	Good
6093	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	60°	54	2.9	Good
6094	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	60°	59	2.9	Good
6095	Polyt. Inst.	Ti-1.25%Mn	1750	6:1	0010	60°	65	2.9	Good
6096	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	60°	76	2.9	Good
6097	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	60°	27	3.0	Good
6098	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	60°	43	2.5	Good
6099	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	60°	49	2.5	Good
6100	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	60°	54	2.7	Good
6101	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	60°	59	2.9	Good
6102	Polyt. Inst.	Ti-12.5%Mn	1750	6:1	0010	60°	68	3.0	Good
6103	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	60°	65	2.9	Good
6104	P & W	Ti-36Al-5Nb	2350	Blank	7052	Flat	189	1.0	Good
6105	P & W	Ti-36Al-5Nb	2350	Blank	7052	Flat	188	1.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
6106	P & W	Ti-36Al-5Nb	2350	Blank	7052	Flat	184	1.0	Good
6116	ARL	Ti-16Al Powder	2200	20:1	0010	90°	84	1.8	Fair
6117	ARL	Ti-16Al Powder	2200	16:1	0010	90°	140	1.3	Poor
6118	ARL	Ti-16Al-10Nb	2200	20:1	0010	90°	49	1.8	Good
6119	ARL	Ti-16Al-10Nb	2200	26:1	0010	90°	49	1.8	Good
6120	ARL	Ti-16Al & Ti-16Al-10Nb	2200	16:1	0010	90°	41	1.8	Good
6123	ARL	Ti-16Al-10Nb	2200	26:1	0010	90°	53	2.0	Good
6124	ARL	Ti-16Al	2200	20:1	0010	90°	49	1.9	Good
6125	ARL	Ti-16Al	2200	26:1	0010	90°	53	1.9	Good
6126	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	78	1.8	Good
6127	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	73	1.8	Good
6128	AFML/LLM	Ti-Beta III	1400	3:1	8871	90°	73	1.8	Good
6130	AFML/LLM	Ti-Beta III	1700	26:1	Poly	90°	146	1.5	Good
6131	AFML/LLM	Ti-6-2-4-6	1800	Blank	Poly	90°	189	1.0	Good
6132	AFML/LLM	Ti-6-2-4-6	1800	Blank	Poly	90°	192	1.0	Good
6133	AFML/LLM	Ti-6-2-4-6	1800	6:1	Poly	90°	70	1.8	Good
6134	AFML/LLM	Ti-6-2-4-6	1800	6:1	Poly	90°	73	1.8	Good
6135	P & W	Ti-36Al-5Nb	2500	Blank	7052	None	194	0	Good
6136	P & W	Ti-36Al-5Nb	2500	Blank	7052	None	189	0	Good
6137	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	90°	19	2.3	Good
6138	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	90°	22	2.4	Good
6139	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	90°	22	2.4	Good
6140	Polyt. Inst.	Ti-0.42%Mn	1750	6:1	0010	90°	22	2.4	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
6141	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	90°	38	2.4	Good
6142	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	90°	32	2.4	Good
6143	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	90°	32	2.4	Good
6144	Polyt. Inst.	Ti-3.2%Mn	1750	6:1	0010	90°	32	2.4	Good
6145	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	90°	43	2.4	Good
6146	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	90°	49	2.3	Good
6147	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	90°	43	2.4	Good
6148	Polyt. Inst.	Ti-5.2%Mn	1750	6:1	0010	90°	43	2.4	Good
6149	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	90°	54	2.4	Good
6150	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	90°	49	2.4	Good
6151	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	90°	49	2.4	Good
6152	Polyt. Inst.	Ti-8.0%Mn	1750	6:1	0010	90°	49	2.4	Good
6153	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	90°	59	2.4	Good
6154	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	90°	54	2.4	Good
6155	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	90°	59	2.4	Good
6156	Polyt. Inst.	Ti-10.2%Mn	1750	6:1	0010	90°	57	2.4	Good
6157	Polyt. Inst.	Ti-12.5%Mn	1750	6:1	0010	90°	65	2.4	Good
6158	Polyt. Inst.	Ti-12.5%Mn	1750	6:1	0010	90°	59	2.4	Good
6159	Polyt. Inst.	Ti-12.5%Mn	1750	6:1	0010	90°	59	2.4	Good
6160	Polyt. Inst.	Ti-12.5%Mn	1750	6:1	0010	90°	65	2.4	Good
6161	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	90°	65	2.4	Good
6162	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	90°	65	2.4	Good
6163	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	90°	65	2.4	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
6164	Polyt. Inst.	Ti-15.4%Mn	1750	6:1	0010	90°	65	2.4	Good
6165	AFML/LLM	Ti-Beta III	1750	10:1	0010	90°	92	1.8	Good
6166	AFML/LLM	Ti-Beta III	1750	10:1	0010	90°	103	1.8	Good
6167	Army Res.	Al-4Cu-0.75Mg+5w/o	800	20:1	Poly	90°	81	1.8	Good
6168	ARL	Ti-36Al Rep. Powder	2500	16:1	7740	90°	80	1.8	Good
6169	ARL	Ti-36Al Rep. Powder	2500	20:1	7740	90°	86	1.7	Good
6170	ARL	Ti-36Al-5Nb	2500	16:1	7740	90°	103	1.6	Good
6171	ARL	Ti-36Al-5Nb	2500	20:1	7740	90°	113	1.5	Good
6172	ARL	TI-36Al-2.5Nb	2500	16:1	7740	90°	92	1.7	Good
6173	ARL	Ti-36Al Rep. Powder	2500	26:1	7740	90°	130	1.5	Good
6174	ARL	Ti-36Al-5Nb	2500	26:1	7740	90°	103	1.7	Good
6191	AFML/LLM	Ti-13V-11Cr-3Al	1400	10:1	8871	60°	186	1.4	Good
6205	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	124	2.9	Good
6206	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	122	3.0	Good
6207	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	119	3.0	Good
6208	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	127	3.0	Good
6209	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	119	3.0	Good
6210	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	127	3.0	Good
6211	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	124	3.0	Good
6212	AFML/LLS	Ti-5Al-5Sn+	1600	6:1	0010	90°	116	3.0	Good
6214	AFML/LLM	Ti-6-4+Y	1500	10:1	8871	90°	132	3.0	Good
6215	AFML/LLM	Ti-6-4+Y	1650	10:1	0010	90°	97	3.1	Good
6216	AFML/LLM	Ti-6-4+Y	1750	10:1	0010	90°	65	3.3	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
6217	AFML/LLM	Ti-13V-11Cr+	1750	20:1	0010	90°	165	2.0	Good
6218	AFML/LLM	Ti-6-4+Y	1550	10:1	0010	90°	46	3.1	Good
6219	AFML/LLM	Ti-Al+Ti_3Al	2500	26:1	7740	90°	55	2.0	Good
6220	AFML/LLM	Ti-Al+Ti_3Al	2500	26:1	7740	90°	54	2.0	Good
6221	AFML/LLM	Ti-Al+5Cb	2550	26:1	7740	90°	76	1.9	Good
6242	Battelle	Ti-35Al_3-Y_2O_3	2575	15.5:1	7740	90°	63	1.9	Good
6243	Battelle	Ti-35Al_3-Y_2O_3	2575	15.5:1	7720	90°	73	1.8	Good
6244	Battelle	Ti-34Al_3-Y_2O_3	2575	16:1	Poly	90°	81	1.7	Fair
6259	AFML/LLM	Ti-6Al-2Sn-4Zr-6Mo	1800	6.7:1	Poly	90°	62	1.9	Good
6253	AFML/LLM	Ti-Al	2550	26:1	7740	90°	68	1.6	Good
6254	AFML/LLM	Ti-3Al+10Nb	2200	26:1	0010	90°	59	1.7	Good
6256	AFML/LLM	Ti-3Al	2200	26:1	0010	90°	53	1.9	Good
6257	AFML/LLM	Ti-3Al	2200	26:1	0010	90°	52	1.7	Good
6258	AFML/LLM	Ti-5Al-2Sn-4Zr-6Mo	1800	-	Poly	90°	162	.0	Good
6282	Battelle	Ti-34Al-1.5Y_2O_3	2575	20:1	7740	90°	62	1.9	Good
6283	Battelle	Ti-34Al-1.3Y_2O_3	2575	20:1	7740	90°	70	1.7	Good
6284	Battelle	Ti-34Al-1.5Y_2O_3	2575	20:1	7740	90°	73	1.7	Good
6285	Polyt. Inst.	Ti-Mn Alloy	1292	2.3:1	Poly	90°	51	2.2	Good
6289	Polyt. Inst.	Ti-10.2%Mn	1200	2.3:1	Poly	90°	100	1.8	Good
6292	Battelle	Ti-34Al-3w/o-Y_2O_3	2575	15:1	7740	90°	54	1.8	Good
6293	Battelle	Ti-34Al-3w/o-Y_2O_3	2575	15:1	7740	90°	70	1.7	Fair
6325	AFML/LLM-1	Ti Alloy #1	2200	26.2:1	0010	90°	65	1.8	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Titanium Base						
6326	AFML/LLM-1	Ti Alloy #2	2200	26.2:1	0010	90°	78	1.8	Good
6327	AFML/LLM-1	Ti Alloy #8	2200	26.2:1	0010	90°	68	1.8	Good
6328	AFML/LLM-1	Ti Alloy #3	2500	26.2:1	7740	90°	54	1.9	Good
6329	AFML/LLM-1	Ti-Alloy #4	2500	26.2:1	7740	90°	65	1.8	Good
6330	AFML/LLM-1	Ti Alloy #6	2500	26.2:1	7740	90°	70	1.7	Good
6331	AFML/LLM-1	Ti Alloy #7	2500	26.2:1	7740	90°	59	1.8	Good
6332	AFML/LLM-1	Ti Alloy #397	2550	26.2:1	7740	90°	59	1.8	Striation Twisted
6333	AFML/LLM-1	Ti Alloy #5	2550	26.2:1	7740	90°	59	1.8	Good
6340	AFML/LLM-1	Ti-10V-2Fe-3Al	1300	5.76:1	8871	90°	97	3.0	Excellent
6341	AFML/LLM-1	Ti-10V-2Fe-3Al	1175	5.76:1	8871	90°	-	1.6	Excellent
6342	AFML/LLM-1	Ti-10V-2Fe-3Al	1000	5.76:1	8871	90°	175	.5	Good
6343	AFML/LLM-1	Ti-10V-2Fe-3Al	1000	5.76:1	8871	90°	181	1.0	Good
6344	Polyt. Inst.	Ti-12.5Mn	1000	2.35:1	Poly	90°	84	1.0	Good
6345	Polyt. Inst.	Ti-12.5Mn	1000	2.35:1	Poly	90°	86	1.0	Good
6346	AFML/LLM-1	Ti-Beta III	1600	25.3:1	8871	90°	140	1.9	Excellent
6348	AFML/LLM-1	Ti-10V-2Fe-3+	1000	5.75:1	Poly	90°	194	2.0	Stuck
6349	AFML/LLM-1	Ti-10V-2Fe-3+	1150	5.75:1	Poly	90°	159	2.0	Good
6350	AFML/LLM-1	Ti-10V-2Fe-3+	1000	5.75:1	Poly	90°	165	1.8	Good
6351	AFML/LLM-1	Ti-10V-2Fe-3+	1000	5.75:1	Poly	90°	155	2.0	Good
6352	AFML/LLM-1	Ti-10V-2Fe-3+	1000	Bare	Poly	90°	147	2.0	Good
6353	AFML/LLM-1	Ti-10V-2Fe-3+	1150	5.9:1	Poly	90°	197	2.1	Stuck

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Titanium Base							
6354	AFML/LLM-1	Ti-	1150	5.9:1	Poly	90°	151	1.8	Good
6355	AFML/LLM-1	Ti-	1150	5.9:1	Poly	90°	146	2.0	Good
6356	AFML/LLM-1	Ti-	1150	5.9:1	Poly	90°	153	1.9	Good
6357	AFML/LLM-1	Ti-	1150	5.9:1	Poly	90°	143	2.0	Good
6381	AFML/LLM	Ti Alloy #395	2575	26:1	7740	90°	62	2.0	Good
6382	AFML/LLM	Ti Alloy #5	2575	26:1	7740	90°	76	2.0	Good
6383	AFML/LLM	Ti Alloy #4	2575	26:1	7740	90°	65	2.0	Good
6384	AFML/LLM	Ti Alloy #6	2575	26:1	7740	90°	65	2.5	Good
6385	AFML/LLM	Ti Alloy #397	2575	26:1	7740	90°	70	2.0	Good
6386	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	.7	Good
6387	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	81	.7	Good
6388	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	81	.7	Good
6389	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	.7	Good
6390	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	78	.7	Good
6391	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	.7	Good
6392	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	.7	Good
6393	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	92	.7	Good
6394	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	89	.7	Good
6395	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	86	.7	Good
6396	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	78	.7	Good
6397	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	1.8	Good
6398	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	2.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
6399	Polyt. Inst.	Ti-10.2Mn	1100	2:1	Poly	90°	76	2.0	Good
6400	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	81	.6	Good
6401	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	86	.5	Good
6402	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	86	.4	Good
6403	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	80	.5	Good
6404	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	86	.7	Good
6405	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	89	--	Good
6406	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	91	--	Good
6407	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	80	--	Good
6408	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	81	.7	Good
6409	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	80	.7	Good
6410	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	76	.7	Good
6411	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	81	.7	Good
6412	Polyt. Inst.	Ti-12.5Mn	1100	2:1	Poly	90°	80	.6	Good
6413	AFML/LLS	Ti-11.0Al	2200	26:1	0010	90°	65	--	Good
6414	AFML/LLS	Ti-12.34Al	2200	26:1	0010	90°	49	--	Good
6415	AFML/LLS	Ti-13.71Al	2200	26:1	0010	90°	49	--	Good
6416	AFML/LLS	Ti-19.45Al	2200	26:1	0010	90°	68	--	Good
6417	AFML/LLS	Ti-22.50Al	2200	26:1	0010	90°	70	--	Good
6418	AFML/LLS	Ti-24.06Al	2200	26:1	0010	90°	108	--	Good
6419	AFML/LLS	Ti-25.66Al	2200	26:1	0010	90°	124	--	Good
6420	AFML/LLS	Ti-12.14Al+	2200	26:1	0010	90°	97	--	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Titanium Base						
6421	AFML/LLS	Ti-6.07Al+	2200	26:1	0010	90°	155	--	Good
6427	AFML/LLM	Ti-10V-2Fe+	1150	5.76:1	8871	90°	165	1.7	Good
6428	AFML/LLM	Ti-10V-2Fe+	1150	5.76:1	8871	90°	159	1.2	Good
6429	AFML/LLM-1	Ti-Al	2200	26:1	0010	90°	54	1.5	Good
6430	AFML/LLM-1	Ti-Al	2200	26:1	0010	90°	59	1.5	Good
6431	AFML/LLM-1	Ti-Al	2550	6.2:1	7740	90°	41	1.5	Good
6432	AFML/LLM-1	Ti-Al	2550	26:1	7740	90°	68	1.5	Good
6433	AFML/LLM	Ti-	1400	Blank	8871	90°	193	1.8	Good
6434	AFML/LLM	Ti-	1400	Blank	8871	90°	197	--	Good
6435	AFML/LLM	Ti-	1400	Blank	8871	90°	192	1.5	Good
6436	AFML/LLM	Ti-	1400	Blank	8871	90°	193	1.8	Good
6437	AFML/LLM	Ti-10V-2Fe-3Al	1200	5:1	8871	90°	167	1.5	Fair
6438	AFML/LLS	Ti-5Al-5Sn-2Zr+ 2Mo-.25Si	1600	6.1:1	0010	90°	135	2.3	Good
6439	AFML/LLS	Ti-5Al-5Sn-2Zr+ 2Mo-.25Si	1900	6:1	0010	90°	49	2.5	Good
6440	AFML/LLS	Ti-5Al-5Sn-2Zr+ 2Mo-.25Si	1900	6:1	0010	90°	49	2.5	Good
6441	Polyt. Inst.	Ti-Mn	1650	9.9:1	0010	90°	38	2.5	Good
6448	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	1.5	Good
6449	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	1.7	Good
6450	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	82	1.7	Good
6451	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	82	1.8	Good
6452	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	1.7	Good
6453	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	1.7	Good
6454	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	1.8	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
6455	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	1.7	Good
6456	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	84	1.7	Good
6457	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	1.7	Good
6476	AFML/LLM-1	Ti-Al	2550	6:1	7740	90°	63	--	Good
6493	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	41	2.5	Good
6494	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	38	2.5	Good
6495	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	49	2.5	Good
6496	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	49	2.5	Good
6497	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	49	2.5	Good
6498	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	65	2.4	Good
6499	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	70	2.5	Good
6500	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	68	2.5	Good
6501	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	76	2.5	Good
6502	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	77	2.5	Good
6503	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	77	--	Good
6504	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	86	2.5	Good
6505	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	86	2.5	Good
6506	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	86	2.5	Good
6507	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	97	2.5	Good
6508	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	97	2.5	Good
6509	Polyt. Inst.	Ti-Mn	1650	10:1	0010	90°	99	2.5	Good
6510	Univ. CA	Ti-10Co	1650	2.3:1	Poly	90°	49	1.5	Good
6511	Univ. CA	Ti-10Ni	1650	Blank	Poly	90°	47	1.5	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Titanium Base							
6531	AFML/LLM	Ti-10V-2Fe-3Al	1450	3.78:1	8871	90°	74	1.7	Excellent
6532	AFML/LLM	Ti-10V-2Fe-3Al	1450	3.78:1	8871	90°	76	1.6	Excellent
6533	AFML/LLM-1	Ti-Al-35.5w/o	2550	26:1	7740	90°	65	1.3	Good
6534	AFML/LLM-1	Ti-Al-35.5w/o	2550	26:1	7740	90°	89	1.3	Bad
6537	AFML/LLM	Ti-6Al-4V	1650	8:1	Fiske 604	90°	97	2.0	Excellent
6538	AFML/LLM	Ti-6Al-4V	1650	8.3:1	Fiske 604	90°	103	2.0	Excellent
6539	AFML/LLM	Ti-6Al-4V	1650	8.3:1	Fiske 604	90°	101	2.0	Excellent
6540	AFML/LLM	Ti-6Al-4V	1650	8.3:1	Fiske 604	90°	99	2.1	Excellent
6541	AFML/LLN	Ti-8-1-1	1725	10:1	0010	90°	96	1.8	Good
6559	AFML/LLM	Ti-10V-2Fe-3Al	1250	6.76:1	8871	60°	123	1.2	Excellent
6560	Univ. CN	Ti-5522-S	1600	6.34:1	0010	60°	100	1.8	Excellent
6561	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	96	2.0	Excellent
6562	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	101	2.0	Excellent
6563	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	95	2.0	Excellent
6564	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	92	2.0	Excellent
6565	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	103	2.0	Excellent
6566	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	92	2.0	Excellent
6567	AFML/LLS	Ti-20 Alloy	1725	10:1	0010	60°	92	2.0	Excellent
6568	AFML/LLS	Ti-11 Alloy	1600	6:1	0010	90°	116	1.9	Excellent
6569	P & W	Ti-Al-5Nb	2500	6.4:1	7740	90°	43	1.3	Excellent
6570	P & W	Ti-Al-5Nb Powder	2500	6.4:1	7740	90°	38	1.3	Excellent
6571	P & W	Ti-Al-5Nb Powder	2500	6.4:1	7740	90°	32	1.3	Excellent
6585	AFML/LLM	Ti-10V-2Fe-3Al	1250	10:1	8871	60°	134	1.2	Excellent
6588	AFML/LLM	Ti-10V-2Fe-3Al	1150	10:1	8871	60°	170	1.1	Excellent

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Titanium Base							
6589	Polyt. Inst.	Ti-6Al-4V	1700	10:1	0010	--	62	2.7	Good
6590	Polyt. Inst.	Ti-6Al-4V	1700	10:1	0010	--	65	2.8	Good
6591	Polyt. Inst.	Ti-6Al-4V	1700	10:1	0010	60°	61	2.8	Good
6592	Polyt. Inst.	Ti-6Al-4V	1700	10:1	0010	60°	63	2.8	Good
6593	Polyt. Inst.	Ti-6Al-4V	1700	10:1	0010	60°	54	2.8	Good
6594	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	82	2.8	Good
6595	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	86	2.7	Good
6596	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	2.7	Good
6597	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	2.7	Good
6598	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	2.7	Good
6599	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	76	2.7	Good
6600	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	2.9	Good
6601	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	2.7	Good
6602	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	2.7	Good
6603	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	2.7	Good
6604	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	81	2.7	Good
6605	Polyt. Inst.	Ti-6Al-2Sn-4Zr-6Mo	1650	6:1	0010	60°	78	2.7	Good
6614	AFML/LLM-1	Ti-16Al	2200	26:1	0010	90°	57	1.5	Good
6615	AFML/LLM-1	Ti-36Al	2575	26:1	7740	90°	51	1.5	--
6616	AFML/LLM-1	Ti-36Al	2575	26:1	7740	90°	65	1.5	Fair Some Tearing
6617	AFML/LLM-1	Ti-36Al	2575	26:1	7740	90°	62	1.5	Fair Striations
6618	AFML/LLM-1	Ti-36Al-5Nb	2575	26:1	7740	90°	57	1.5	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Titanium Base							
6629	AFML/LLM	Ti-14.6Al-10Nb-4W	2200	26:1	0010	90°	59	1.5	Good
6630	AFML/LLM	Ti-14.6Al-10Nb-4W	2200	26:1	0010	90°	59	1.5	Good
6631	AFML/LLM	Ti-32.5Al-4.6Nb-5W	2575	26:1	7740	90°	57	1.5	Good
6632	AFML/LLM	Ti-32.5Al-4.6Nb-5W	2575	26:1	7740	60°	49	1.5	Good
6633	AFML/LLM	Ti-4.6Al-10Nb-4W	2200	26:1	0010	60°	55	1.5	Good
6662	AFML/LLM	Ti-10V-2Fe-3Al	1150	5.76:1	0010	--	116	2.0	Good
6663	AFML/LLM	TI-10V-2Fe-3Al	1150	5.76:1	0010	90°	132	2.0	Good
6682	AFML/LLM	Ti-6Al-4V-.29%O-1-2%H	1750	10:1	Poly	90°	104	1.5	Good
6683	AFML/LLM	Ti-6Al-4V-.29%O-1-2%H.	1750	10:1	Poly	90°	80	1.5	Good
6684	AFML/LLM	Ti-6Al-4V-.29%O-1-2%H.	1750	10:1	Poly	90°	89	1.4	Good
6685	AFML/LLM	Ti-6Al-4V-29%O-1-2%H	1750	10:1	Poly	90°	81	1.4	Good
6686	AFML/LLM	Ti-10V-2Fe-3Al	1150	5.76:1	8871	90°	139	1.5	Good
6687	AFML/LLM	Ti-5Al-2Sn	1775	10:1	0010	60°	49	1.9	Good
6688	AFML/LLM	Ti-5Al-2Sn	1775	10:1	Poly	60°	59	2.0	Good
6689	AFML/LLM	Ti-5Al-2Sn	1925	10:1	0010	60°	38	2.0	Good
6690	AFML/LLM	Ti-5Al-2Sn	1925	10:1	0010	60°	39	2.0	Good
6691	P & W	Ti-32.5Al-4.6Nb-5W	2575	6:1	7740	90°	59	1.5	Good
6692	P & W	Ti-32.5Al-4.6Nb-5W	2575	6:1	7740	90°	43	1.5	Good
6726	AFML/LLM-1	Ti-Al	2575	26:1	7740	60°	49	1.5	Good
6727	AFML/LLM-1	Ti-Al-Nb-+W	2575	9.6	7740	90°	39	1.5	Good
6728	AFML/LLM-1	Ti_3Al	2200	9.0:1	7052	120°	57	1.4	Good
6731	AFML/LLM	Ti-10V-2Fe-3Al	1150	13:1	8871	60°	151	1.1	Good
6732	AFML/LLM	Ti-662(H)	1750	16:1	Poly	90°	116	1.5	Good
6733	AFML/LLM	Ti-662(H)	1750	16:1	Poly	--	109	1.5	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Titanium Base							
6734	AFML/LLM	Ti-662(H)	1750	16:1	Poly	--	111	1.5	Good
6741	P & W	Ti-32.5Al-4.6Nb-.5W	2550	Blank	7740	90°	189	.5	Good
6742	P & W	Ti-32.5Al-4.6Nb-.5W	2550	Blank	7740	90°	--	--	--
6743	AFML/LLM	Ti-Sponge	1650	Blank	Poly	90°	189	.5	Good
6747	AFML/LLM	Ti-	1650	10:1	Poly	90°	103	1.4	Excellent
6751	P & W	Ti-32.5Al-4.6Nb-.5W	2550	8:1	7740	60°	43	1.5	Excellent
6752	Univ. CA	Ti-50Zr	1700	2.35:1	Poly	60°	49	1.5	Good
6754	AFML/LLS	Ti-8V-4Cr-2Mo-2Fe-3Al	1500	5.3:1	8871	60°	97	1.8	Good
6755	AFML/LLS	Ti-8V-4Cr-2Fe-3Al	1500	5.3:1	8871	60°	108	1.8	Good
6756	AFML/LLS	Ti-15V-3Cr-3Al-3Sn	1500	5.3:1	8871	60°	111	1.8	Good
6757	AFML/LLS	Ti-15V-3Zr-3Al-3Sn	1500	5.3:1	8871	60°	109	1.8	Good
6764	P & W	Ti-32.5Al-4.6Nb-.5W	2550	6:1	7740	60°	32	1.4	Good
6765	P & W	Ti-32.5Al-4.6Nb-.5W	2550	6:1	7740	60°	38	1.4	Good
6766	P & W	Ti-32.5Al-4.6Nb-.5W	2550	6:1	7740	60°	32	1.4	Good
6767	P & W	Ti-32.5Al-4.6Nb-.5W	2550	6:1	7740	60°	32	1.4	Good
6768	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo-.25Si	1600	6:1	0010	60°	157	2.1	Good
6769	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo-.25Si	1900	6:1	0010	60°	59	2.6	Excellent
6770	AFML/LLS	Ti-5Al-5Sn-2Zr-2Mo-.25Si	1900	6:1	0010	60°	68	2.6	Excellent

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Nickel Base							
5401	AFML/LLM	AF2-1DA	2025	None	Poly	90°	178	.5	Good
5402	AFML/LLM	AF2-1DA	2025	None	Poly	90°	178	.5	Good
5403	AFML/LLM	AF2-1DA	2025	None	Poly	90°	184	.5	Good
5404	AFML/LLM	AF2-1DA	2025	None	Poly	90°	181	.5	Good
5405	AFML/LLM	AF2-1DA	2025	None	Poly	90°	178	.5	Good
5406	AFML/LLM	AF2-1DA	2025	None	Poly	90°	184	.5	Good
5407	AFML/LLM	AF2-1DA1	2025	None	Poly	90°	186	.5	Good
5408	AFML/LLM	AF2-1DA2	2025	None	Poly	90°	184	.5	Good
5409	AFML/LLM	AF2-1DA	2025	None	Poly	90°	182	.5	Good
5410	AFML/LLM	AF2-1DA	2025	None	Poly	90°	182	.5	Good
5411	AFML/LLM	AF2-1DA	2025	5:1	Poly	90°	72	1.9	Good
5412	AFML/LLM	AF2-1DA	2025	10:1	Poly	90°	93	1.9	Good
5413	AFML/LLM	AF2-1DA	2025	20:1	Poly	90°	112	1.7	Good
5414	AFML/LLM	AF2-1DA	2150	5:1	Poly	90°	49	2.1	Good
5415	AFML/LLM	AF2-1DA	2150	5:1	Poly	90°	49	2.1	Good
5416	AFML/LLM	AF2-1DA	2150	10:1	Poly	90°	65	2.0	Good
5417	AFML/LLM	AF2-1DA	2150	10:1	Poly	90°	59	2.0	Good
5418	AFML/LLM	AF2-1DA	2150	20:1	Poly	90°	54	2.0	Good
5419	AFML/LLM	AF2-1DA	2150	20:1	Poly	90°	59	1.9	Good
5426	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	15:1	Poly	90°	113	1.7	Good
5427	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	15:1	Poly	90°	113	1.6	Good
5428	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	109	1.7	Good
5429	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	103	1.8	Good
5430	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	113	1.6	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
5431	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	103	1.8	Good
5432	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	135	1.5	Good
5433	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	124	---	Good
5434	Stellite	Ni-16Cr-4Al-Y_2O_3	1850	15:1	Poly	90°	109	1.7	Good
5435	Stellite	Ni-16Cr-4Al-Y_2O_3	1850	15:1	Poly	90°	103	1.7	Good
5437	G.E.	Ni-66.3Al-205Cr-5.25Si	1675	10:1	0010	90°	81	2.0	Poor
5464	G.E.	Ni-66.3Cu-20.5Cr+	1600	10:1	Poly	90°	103	1.9	Good
5465	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	181	1.0	Good
5466	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	184	1.0	Good
5467	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	184	1.0	Good
5468	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	184	1.0	Good
5469	AFML/LLM	AF2-1DA Powder	2150	20:1	Poly	90°	119	1.3	Good
5470	AFML/LLM	AF2-1DA Powder	2150	20:1	Poly	90°	97	1.9	Good
5471	AFML/LLM	AF2-1DA Powder	2150	20:1	Poly	90°	115	1.7	Good
5477	U.C.	Ni-.12C-1.75Ta-12.04 Cr-1.63W-8.89Co (+)	2150	9.25:1	Poly	90°	89	3.2	Good
5478	U.C.	Ni-.12C-1.75Ta-12.04 Cr-1.63W-8.89Co (+)	2150	9.25:1	Poly	60°	97	3.1	Good
5516	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1900	16:1	Poly	90°	146	1.3	Good
5517	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1900	16:1	Poly	90°	119	1.6	Good
5518	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1900	16:1	Poly	90°	111	1.7	Good
5519	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1950	16:1	Poly	90°	92	1.7	Good
5520	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1950	16:1	Poly	90°	103	1.9	Good
5521	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	2000	16:1	Poly	90°	113	1.7	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
5522	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	2000	16:1	Poly	90°	119	1.6	Good
5542	G.E.	Ni-20.5Au-5.25Cr-3.35Si+	1650	10:1	Poly	90°R	92	2.0	Fair
5543	Polymet	Ds-Ni-Cr Powder	2050	25.3:1	None	120°	163	2.5	Good
5544	Polymet	Ds-Ni-Cr Powder	2100	25.3:1	None	120°	130	3.0	Good
5545	Polymet	Ds-Ni-Cr Powder	2150	25.3:1	None	120°	146	2.5	Good
5546	Polymet	Ds-Ni-Cr Powder	2200	25.3:1	None	120°	127	2.9	Good
5547	Polymet	Ds-Ni-Cr Powder	2250	25.3:1	None	120°	132	2.9	Good
5548	Polymet	Ds-Ni-Cr Powder	2250	25.3:1	None	120°	190	1.0	Good
5549	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	119	1.9	Good
5550	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	130	1.7	Good
5551	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	124	1.9	Good
5552	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	103	2.0	Good
5553	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	100	2.0	Good
5554	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	116	1.7	Good
5555	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	122	1.8	Good
5556	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	124	1.7	Good
5557	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	108	1.9	Good
5558	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	116	1.7	Good
5559	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	127	1.7	Good
5560	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	130	1.7	Good
5561	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	119	1.8	Good
5562	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	96	2.1	Good
5563	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	92	2.1	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
5564	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	107	1.8	Good
5565	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	116	2.0	Good
5566	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	113	1.8	Good
5567	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	100	1.9	Good
5581	G.E.	Ni-15Cr-4Al-2ThO_2	2100	10:1	Poly	90°R	68	2.0	Good
5582	G.E.	Ni-15Cr-4Al-2ThO_2	1900	10:1	Poly	90°R	97	1.9	Good
5591	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	182	.5	Good
5592	AFML/LLM	AF2-1DA Powder	2025	None	Poly	90°	181	0.5	Good
5593	AFML/LLM	AF2-1DA Powder	2025	None	Poly	120°	151	1.3	Good
5594	AFML/LLM	AF2-1DA Powder	2025	None	Poly	120°	117	---	Good
5598	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	116	1.7	Good
5599	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	134	8.0	Good
5600	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	124	2.0	Good
5601	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	111	2.1	Good
5602	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	135	8.5	Good
5603	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	112	2.0	Good
5604	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	113	2.1	Good
5605	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	116	2.0	Good
5606	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	124	2.0	Good
5607	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	111	2.1	Good
5608	Polymet	Ds-Ni Alloy	2150	3:1	Poly	90°	41	2.2	Good
5609	Polymet	Ds-Ni Alloy	2150	None	Poly	90°	178	0.5	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Nickel Base						
5610	Polymet	Ds-Ni Alloy	2150	None	Poly	90°	175	0.5	Good
5614	Polymet	Ds-Ni-Cr Powder	2150	25.3:1	Poly	120°	97	2.0	Good
5616	G.E.	85.5Ni-6.0Cr-4.5Si+	1575	10:1	Poly	90°R	103	2.6	Good
5617	G.E.	85.5Ni-6.0Cr-4.5Si+	1675	10:1	Poly	90°R	92	2.8	Good
5618	G.E.	85.5Ni-6.0Cr-4.5Si+	1625	10:1	Poly	90°R	95	2.7	Good
5619	G.E.	85.5Ni-6.0Cr-4.5Si+	1725	10:1	Poly	90°R	81	3.0	Good
5661	AFML/LLM	713-C	2200	Blank	Poly	---	184	1.0	Good
5662	AFML/LLM	713-C	2200	Blank	Poly	---	189	1.0	Good
5663	Polymet	Ds-Ni	2150	25:1	Poly	120°	122	3.0	Good
5664	Polymet	Ds-Ni	2150	25:1	Poly	120°	84	3.1	Good
5665	Polymet	Ds-Ni	1850	25:1	Poly	120°	173	---	Good
5666	Polymet	Ds-Ni	2150	25:1	Poly	120°	122	1.6	Good
5667	Polymet	Ds-Ni	2150	25:1	Poly	120°R	105	3.0	Good
5717	Polymet	Ds-Ni	1850	25.3:1	Poly	120°	119	3.0	Good
5718	Polymet	Ds-Ni	2000	25.3:1	Poly	120°	108	3.0	Good
5719	Polymet	Ds-Ni	2000	25.3:1	Poly	120°	113	2.0	Good
5720	Polymet	Ds-Ni	2000	Blank	Poly	120°	184	3.0	Good
5721	Polymet	Ds-Ni	2000	3:1	Poly	90°	41	3.5	Good
5722	Polymet	Ds-Ni	2000	3:1	Poly	90°	38	3.3	Good
5723	Polymet	Ds-Ni	2000	3:1	Poly	90°	41	3.3	Good
5756	Polymet	Ds-Ni	1650	25:1	Poly	120°	180	1.9	Good
5757	Polymet	Ds-Ni	1700	25:1	Poly	120°	155	2.9	Good
5758	Polymet	Ds-Ni	1800	25:1	Poly	120°	127	2.7	Good
5759	Polymet	Ds-Ni	2000	25:1	Poly	120°	123	3.0	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Nickel Base						
5760	Polymet	Ds-Ni	2000	10:1	Poly	90°R	178	---	Good
5786	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	117	2.0	Good
5787	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.5:1	Poly	120°	119	1.9	Good
5788	Ste-lite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	119	1.8	Good
5789	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.5:1	Poly	120°	119	1.9	Good
5790	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	0010	90°	104	2.0	Good
5791	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.5:1	0010	120°	113	2.0	Good
5792	Stellite	NI-16Cr-4Al-Y_2O_3	1900	15:1	0010	90°	108	2.0	Good
5793	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	0010	120°	113	1.9	Good
5794	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Bare	90°	182	0.3	Good
5795	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.5:1	Bare	120°	181	0.4	Good
5796	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	0010	90°	182	1.7	Good
5797	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.7:1	0010	120°	188	0.3	Good
5798	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Bare	90°	138	1.4	Good
5799	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	Bare	120°	146	1.3	Good
5800	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	0010	90°	143	1.5	Good
5801	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	0010	120°	130	1.6	Good
5802	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	130	1.7	Good
5803	Stellite	NI-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	146	1.6	Good
5804	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	Poly	90°	165	7.5	Good
5827	Polymet	Ds-Ni	2000	10:1	Poly	90°R	139	2.0	Good
5828	Polymet	Ds-Ni	2000	10:1	Poly	90°R	151	2.0	Good
5829	Polymet	Ds-Ni	2000	10:1	Poly	90°R	167	2.0	Good
5842	Polymet	Ds-Ni	1800	9:1	Poly	90°	136	2.7	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Nickel Base						
5843	Polymet	Ds-Ni	1850	9:1	Poly	90°	116	3.0	Good
5844	Polymet	Ds-Ni	1850	11.4:1	Poly	90°	124	3.0	Good
5845	Polymet	Ds-Ni	2000	25.3:1	Poly	90°	100	3.0	Good
5846	Polymet	Ds-Ni	2000	9.2:1	Poly	90°	68	3.5	Good
5847	Polymet	Ds-Ni	2000	25.3:1	Poly	90°	96	3.1	Good
5850	Stellite	Ni-16Cr-4Al-Y_2O_3	1850	16:1	0010	Shear	108	1.9	Good
5851	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	0010	Shear	100	2.0	Good
5852	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	0010	Shear	132	7.5	Good
5853	Stellite	Ni-16Cr-4Al-Y_2O_3	1950	16:1	0010	Shear	103	1.9	Good
5866	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.8:1	Poly	90°	108	1.6	Good
5867	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.8:1	Poly	90°	124	1.5	Good
5868	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.7:1	Poly	90°	122	1.6	Good
5869	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.7:1	Poly	90°	116	1.6	Good
5870	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15:1	POly	90°	113	1.6	Good
5871	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.6:1	Poly	90°	118	1.7	Good
5872	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.7:1	Poly	90°	119	1.6	Good
5873	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.8:1	Poly	90°	119	1.6	Good
5884	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	Poly	90°	109	1.6	Good
5885	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	Poly	90°	117	1.5	Good
5886	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	Poly	90°	119	1.6	Good
5887	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	15.9:1	Poly	90°	124	1.6	Good
5968	(W) R&D	IN-738	2200	10:1	Poly	90°	51	2.0	Good
5969	(W) R&D	IN-738 Powder	2125	10:1	Poly	90°	59	2.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Nickel Base							
5970	G.E	63Ni-30Cu-4Si	1650	10:1	Poly	90°R	93	1.7	Good
5971	G.E.	63Ni-30Cu-4Si	1650	10:1	Poly	90°R	81	1.7	Good
5972	G.E.	63Ni-30Cu-4Si	1650	10:1	Poly	90°R	95	1.8	Good
5973	G.E.	63Ni-30Cu-4Si	1650	10:1	Poly	90°R	84	1.8	Good
5976	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	---	1.8	Good
5977	Polymet	ODS Ni Alloy	2000	10:1	Poly	90°	81	1.8	Good
5978	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	82	1.8	Good
5979	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	115	1.5	Good
5980	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	122	1.8	Good
5981	Polymet	ODS Ni Alloy	2000	20:1	Poly	120°	84	1.9	Good
5982	Polymet	ODS Ni Alloy	2050	25:1	Poly	120°	103	1.8	Good
5983	Polymet	ODS Ni Alloy	1700	3:1	Poly	90°	69	2.0	Good
5985	AFML/LLM	Beta III	1750	2:1	Bare	90°	54	2.1	Good
5987	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	1900	16:1	Poly	90°	92	1.7	Good
5988	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	1900	15.8:1	Poly	90°	100	1.7	Good
5989	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	1900	16:1	Poly	90°	105	1.6	Good
5990	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2000	15.8:1	Poly	90°	90	1.9	Good
5991	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2000	15.8:1	Poly	90°	97	1.8	Good
5992	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2000	16:1	Poly	90°	107	1.8	Good
5993	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2100	16:1	Poly	90°	92	1.8	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Nickel Base						
5994	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2100	15.5:1	Poly	90°	97	1.8	Good
5995	Stellite	Co-20Ni-18Cr-4.5Al-Y_2O_3	2100	15.8:1	Poly	90°	108	1.7	Good
5996	Polymet	ODS Ni Alloy	900	Blank	Poly	120°R	184	1.0	Good
5997	Polymet	ODS Ni	2000	20:1	Poly	120°R	86	1.7	Good
5998	Polymet	ODS Ni	2000	10:1	Poly	90°	54	2.0	Good
5999	Polymet	ODS Ni	2000	10:1	Poly	90°	70	2.0	Good
6001	P & W	IN-792 Powder	1975	6:1	0010	90°	105	1.7	Good
6002	P & W	IN-792 Powder	2025	6:1	0010	90°	76	2.0	Good
6003	P & W	IN-792 Powder	2025	8:1	0010	90°	86	1.8	Good
6004	P & W	IN-792 Powder	2000	6:1	0010	90°	100	1.7	Good
6005	P & W	IN-792 Powder	2000	8:1	0010	90°	113	1.5	Good
6006	P & W	IN-792 Powder	2050	6:1	0010	90°	76	1.9	Good
6007	Polymet	ODS NI	2000	25:1	Poly	90°	103	1.9	Good
6008	Polymet	ODS Ni	2000	25:1	Poly	90°	122	1.6	Good
6010	Polymet	ODS Ni	1950	14:1	Poly	90°	81	1.9	Good
6011	Polymet	ODS Ni	1950	48.76:1	Poly	90°	140	1.5	Good
6023	Polymet	ODS Ni	1825	14:1	Poly	90°	95	2.1	Good
6027	Stellite	ODS Co Base Alloy	1900	15.3:1	Poly	90°	105	1.5	Good
6028	Stellite	ODS Co Base Alloy	2100	15.4:1	Poly	90°	86	1.8	Good
6029	Stellite	ODS Co Base Alloy	2100	10:1	Poly	90°	76	1.7	Good
6030	Stellite	ODS Co Base Alloy	2100	20.4:1	Poly	90°	101	1.9	Good
6031	Stellite	ODS Co Base Alloy	2100	15.4:1	Poly	90°	100	5.8	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Nickel Base						
6032	Stellite	ODS Co Base Alloy	2100	10:1	Poly	90°	86	6.0	Good
6033	Stellite	ODS Co Base Alloy	2000	15.3:1	Poly	90°	99	1.9	Good
6034	Stellite	ODS Co Base Alloy	2200	15.11:1	Poly	90°	81	2.0	Good
6035	Stellite	ODS Co Base Alloy	2200	15.4:1	Poly	90°	97	1.9	Good
6054	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	124	1.4	Good
6055	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	130	1.3	Good
6056	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	127	1.3	Good
6057	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	130	1.2	Good
6058	U. C.	AF2-1DA Powder	2000	15:95:1	0010	60°	124	1.4	Good
6059	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	113	1.5	Good
6060	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	135	1.4	Good
6061	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	130	1.5	Good
6062	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	130	1.5	Good
6063	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	124	1.5	Good
6064	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	116	1.5	Good
6065	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	116	1.4	Good
6066	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	122	1.5	Good
6067	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	119	1.5	Good
6068	U. C.	AF2-1DA Powder	2000	15.95:1	0010	60°	117	1.5	Good
6069	P & W	Alloy #1	2070	10:1	Poly	90°	104	2.0	Good
6070	P & W	Alloy #2	2070	10:1	Poly	90°	104	1.9	Good
6071	P & W	Alloy #4	2015	10:1	Poly	90°	131	1.7	Good
6072	P & W	Alloy #5	2015	10:1	Poly	90°	127	1.8	Good
6073	P & W	Alloy #3	2030	10:1	Poly	90°	135	1.7	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6083	Polymet	ODS Ni Alloy	2000	9.2:1	Poly	90°	124	2.1	Good
6113	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	143	1.6	Good
6114	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	151	2.2	Good
6115	Polymet	ODS Ni Alloy	2000	25:1	Poly	90°	157	1.9	Good
6121	Polymet	ODS Ni Alloy	2000	12:1	Poly	90°	97	2.0	Good
6122	Polymet	ODS Ni Alloy	2000	5.58:1	Poly	90°	65	2.2	Good
6183	Polymet	MA-754 ODS Alloy	2050	25:1	Poly	90°R	130	2.0	Good
6184	Polymet	Ds-Ni-Cr	2050	20:1	Poly	90°R	109	1.9	Good
6185	Polymet	Ds-Ni-Cr	2050	10:1	Poly	90°	143	1.6	Good
6186	Polymet	Ds-Ni-Cr	2050	10:1	Poly	90°R	151	1.0	Good
6187	Polymet	Ds-Ni-Cr	2050	10:1	Poly	90°R	184	.0	Good
6236	P & W	Ni-14.3Cr-17Co-5Mo+	2000	10:1	Poly	60°	122	1.6	Good
6237	P & W	Ni-12.2Cr-16.5Co-2.8Mo	2060	10:1	Poly	60°	146	1.8	Good
6238	P & W	Ni-12.3Cr-14.7Co-3.9Mo	2065	10:1	Poly	60°	167	1.0	Good
6239	P & W	Ni-12.3Cr-17.7Co-3.2Mo	2099	10:1	Poly	60°	165	1.0	Good
6240	P & W	Ni-12.1Cr-17.4Co-3.2Mo	2105	10:1	Poly	60°	122	2.1	Good
6241	P & W	Ni-12.2Cr-17.6Cr-3.2Mo	2110	10:1	Poly	60°	119	2.0	Good
6245	P & W	Ni-12Cr-10.3Co-2.9Mo	2115	10:1	Poly	60°	116	2.0	Good
6246	P & W	Ni-12.2Cr-10.3Co+	2115	10:1	Poly	60°	127	2.0	Good
6247	P & W	Ni-12.2Cr-8.9Co+	2115	10:1	Poly	60°	92	2.1	Good
6248	P & W	Ni-12.3Cr-9.0Co+	2180	10:1	Poly	60°	81	2.1	Good
6250	Polymet	ODS Ni	2050	10:1	Poly	90°	146	1.4	Good
6251	Polymet	Fe-Cr-Al-Y	2100	---	Poly	---	---	---	---

R- Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6252	Polymet	Ni-Cr-Al-Y	2100	---	Poly	---	184	.0	---
6260	Stellite	Ni-16Cr-4Al-1.3Y_2O_3	1800	16:1	Poly	90°	116	1.7	Good
6261	Stellite	Ni-16Cr-4Al-1.33Y_2O_3	1900	16:1	Poly	90°	124	1.7	Good
6290	AFML/LLM	U-700	2050	3.1:1	Poly	60°	45	1.8	Good
6294	S. M.	Ni-16Cr-.5Al+	2050	10:1	Poly	90°	92	1.7	Good
6295	S. M.	Ni-16Cr-5%Al+	2050	10:1	Poly	90°	89	1.9	Good
6296	S. M.	Ni-16Cr-5Al+	2050	10:1	Poly	90°	86	2.0	Good
6297	S. M.	Ni-16Cr-5Al+	2050	10:1	Poly	90°	86	1.9	Good
6299	Polymet	Ni-20Cr-2-Y+	2100	2:1	Bare	Vane	---	---	---
6300	Polymet	Ni-Cr-Al-Y	2100	2:1	Bare	Vane	---	---	---
6301	Polymet	Ni-20Cr-2-Y+	2100	2:1	Bare	Vane	---	---	---
6321	WAESD	Ni-14Cr-7.5Co+	2150	Blank	Poly	90°	189	1.0	Can Wrinkled
6322	WAESD	Ni-14Cr-7.5Co+	2150	Blank	Poly	90°	189	1.0	Can Wrinkled
6323	WAESD	Ni-14Cr-7.5Co+	2150	9.44:1	Poly	90°	68	2.0	Good
6324	WAESD	Ni-14Cr-7.5Co+	2150	9.44:1	Poly	90°	76	2.0	Good
6358	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	197	1.5	Good
6359	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	190	1.5	Good
6360	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	190	1.5	Good
6361	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	193	1.5	Good
6362	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	192	1.5	Good
6363	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	192	1.5	Good
6364	S. G.	ODS Ni Powder	1900	Blank	Poly	90°	194	1.5	Good
6365	S. G.	Ni-16Cr-4.5Al	1900	11.15:1	Poly	90°	124	2.3	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Nickel Base						
6366	S. G.	Ni-16Cr-4.5Al	1900	16.2:1	Poly	90°	135	2.9	Good
6367	S. G.	Ni-16Cr-4.5Al	1950	11.15:1	Poly	90°	100	2.3	Good
6368	S. G.	Ni-16Cr-4.5Al	1950	16.2:1	Poly	90°	111	2.2	Good
6369	S. G.	Ni-16Cr-4.5Al	2000	11.15:1	Poly	90°	95	2.3	Good
6370	S. G.	Ni-16Cr-4.5Al	2000	16.2:1	Poly	90°	103	2.2	Good
6371	S. G.	Ni-16Cr-4.5Al	2050	16.2:1	Poly	90°	105	2.1	Good
6462	Stellite	Ni-	1850	16:1	Poly	90°	135	3.0	Good
6463	Stellite	Ni-	1900	16:1	Poly	90°	131	5.0	Good
6464	Stellite	Ni-Base	1900	16:1	Poly	90°	130	5.3	Good
6465	Stellite	Ni-	1950	16:1	Poly	90°	132	4.8	Good
6466	Stellite	Ni-	2000	16:1	Poly	90°	115	5.2	Good
6467	Stellite	Ni-	2100	16:1	Poly	90°	96	5.5	Good
6442	Stellite	ODS Powder	1900	16:1	Poly	90°	130	3.5	Good
6443	Stellite	ODS Powder	1900	16:1	Poly	90°	138	4.2	Good
6444	Stellite	ODS Powder	2000	16:1	Poly	90°	122	.5	Good
6445	Stellite	ODS Powder	2000	16:1	Poly	90°	140	5.0	Good
6477	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	189	1.0	Good
6478	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	186	1.0	Good
6479	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	189	.9	Good
6480	S. G.	Ni-16Cr-6Al-Y_2O_3	1900	Blank	Poly	90°	189	.9	Good
6481	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	192	.9	Good
6482	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	193	.9	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6483	S. G.	Ni-16Cr-5Al-Th_{02}	1900	Blank	Poly	90°	192	.9	Good
6484	S. G.	Ni-66Cr-5Al-Th_{02}	1900	Blank	Poly	90°	19	.9	Good
6485	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	109	.9	Good
6486	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	16.3:1	Poly	90°	113	1.9	Good
6487	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	95	2.0	Good
6488	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	16.3:1	Poly	90°	111	1.9	Good
6489	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	97	---	Good
6490	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	16.3:1	Poly	90°	108	2.0	Good
6491	S. G.	Ni-16Cr-5Al-Th_{02}	1950	11:1	Poly	90°	97	2.1	Good
6492	S. G.	Ni-16Cr-5Al-Th_{02}	1950	16.3:1	Poly	90°	112	2.0	Good
6525	G. E.	YD-Ni-Cr-Al-Y_2O_3	2050	13:1	Poly	120°	116	2.0	Good
6526	G. E.	YD-Ni-0.3-Y_2O_3	2050	13:1	Poly	120°	124	2.0	Good
6527	G. E.	YD-Ni-0.7-Y_2O_3	2050	13:1	Poly	120°	122	2.0	Good
6528	G. E.	YD-Ni-Cr-Al-Y_2O_3	2100	13:1	Poly	120°	101	2.2	Good
6529	G. E.	YD-Ni-0.3-Cr-Al-Y_2O_3	2100	13:1	Poly	120°	108	2.2	Good
6530	G. E.	YD-Ni-0.7%-Y_2O_3	2100	13:1	Poly	120°	108	2.1	Good
6543	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	184	1.0	Good
6544	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	186	1.0	Good
6545	S. G.	Ni-16Cr-5Al-Y_2O_3	1800	Blank	Poly	90°	189	1.0	Good
6546	S. G.	Ni-16Cr-5Al-Y_2O_3	1800	Blank	Poly	90°	189	1.0	Good
6547	S. G.	NI-16Cr-5Al-Y_2O_3	1800	Blank	Poly	90°	189	1.0	Good
6548	S. G.	Ni-16Cr-5Al-Y_2O_3	1800	Blank	ϕPoly	90°	189	1.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6549	S. G.	Ni-16Cr-5Al-Y_2O_3	1800	Blank	Poly	90°	186	1.0	Good
6550	S. G.	Ni-16Cr-5Al-Y_2O_3	1800	Blank	Poly	90°	188	1.0	Good
6551	S. G.	Ni-16Cr-5Al-Y_2O_3	1850	11:1	Poly	90°	116	1.9	Good
6552	S. G.	Ni-16Cr-5Al-Y_2O_3	1850	11:1	Poly	90°	124	1.9	Good
6553	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	11:1	Poly	90°	92	1.9	Good
6554	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	11:1	Poly	90°	103	1.9	Good
6555	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	103	1.9	Good
6556	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	101	1.9	Good
6557	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	97	1.9	Good
6558	S. G.	Ni-16Cr-5Al-Y_2O_3	1950	11:1	Poly	90°	119	1.9	Good
6572	P & W	IN-100 Mod.	1950	6:1	Poly	90°	154	1.0	Good Surface
6573	P & W	IN-100 RSR-140 Mesh #38	1950	6:1	Poly	90°	124	1.0	Good
6574	P & W	IN-100 RSR-140 Mesh #40	1950	6:1	Poly	90°	135	1.0	Good
6575	P & W	IN-100 FM-100 Mesh	1950	6:1	Poly	90°	124	1.0	Good
6576	P & W	IN-100 RSR-#41-140 Mesh	1950	6:1	Poly	90°	127	1.0	Good
6577	P & W	IN-100 RSR Mixture-230 Mesh	1950	6:1	Poly	90°	122	1.0	Good
6578	P & W	IN-100 Mod.	1900	6:1	Poly	90°	185	.5	---
6579	P & W	IN-100 Mod.	1975	6:1	Poly	90°	139	1.0	Good
6580	P & W	IN-100 Mod.	1975	6:1	Poly	90°	132	1.0	---
6583	Battelle	Ni-Si-1	1832	16:1	Poly	90°	118	1.2	Good
6606	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	139	1.9	Good
6607	Stellite	Ni-16Cr-4Al-Y_2O_3	2100	16:1	Poly	90°	99	3.1	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6608	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	106	2.9	Good
6609	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	95	2.9	Good
6610	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	139	2.4	Good
6611	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	151	2.3	Good
6612	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	145	2.4	Good
6613	Stellite	Ni-16Cr-4Al-Y_2O_3	2000	16:1	Poly	90°	140	2.6	Good
6619	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	153	2.6	Good
6620	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	156	2.0	Good
6621	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	170	1.9	Good
6622	Stellite	Ni-16Cr-4Al-Y_2O_3	1800	16:1	Poly	90°	167	2.2	Good
6623	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	153	2.8	Good
6624	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	164	2.6	Good
6625	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	152	2.6	Good
6626	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	161	2.5	Good
6634		IN-100-140-220 Mesh	1850	Blank	Poly	90°	188	.5	Good
6635	P & W	IN-100-140-220 Mesh	1850	Blank	Poly	90°	194	.5	Good
6636	P & W	IN-100-140 220 Mesh	1850	Blank	Poly	90°	190	---	Good
6637	P & W	IN-100-140-220	1850	Blank	Poly	90°	190	.5	Good
6638	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	189	.5	Good
6639	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	192	.5	Good
6640	P & W	MARM-200-80-140 Mesh	2000	Blank	Poly	90°	190	.5	Good
6641	P & W	MARM-200-80-140 Mesh	2000	Blank	Poly	90°	186	.5	Good
6642	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	192	.5	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Nickel Base							
6643	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	189	.5	Good
6644	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	190	.5	Good
6645	P & W	MARM-200-140-325 Mesh	2000	Blank	Poly	90°	190	---	Good
6647	P & W	IN-100-140-220 Mesh	1950	6:1	Poly	90°	132	1.2	Good
6648	P & W	IN-100-140-200 Mesh	1950	6:1	Poly	90°	122	1.2	Good
6649	P & W	IN-100-140-200 Mesh	1950	6:1	Poly	90°	135	1.2	Good
6650	P & W	IN-100-140-220 Mesh	1950	6:1	Poly	90°	132	1.2	Good
6651	P & W	MARM-200-140-325 Mesh	1950	6:1	Poly	90°	113	1.1	Fair
6652	P & W	MARM-200-80-140	1950	6:1	Poly	90°	157	1.1	Fair
6653	P & W	MARM-200-140-325	1950	6:1	Poly	90°	160	1.0	Good
6654	P & W	MARM-200-140-325	2050	6:1	Poly	90°	86	1.5	Good
6655	P & W	MARM-200-80-140	2050	6:1	Poly	90°	105	1.4	Good
6656	P & W	MARM-200-140-325	2050	6:1	Poly	90°	105	1.4	Good
6657	P & W	MARM-200-140-325	2050	6:1	Poly	90°	97	1.4	Good
6658	P & W	MARM-200-140-325	2050	6:1	Poly	90°	108	1.3	Good
6659	P & W	MARM-200	2050	6:1	Poly	90°	100	1.4	Good
6660	P & W	MARM-200	2050	6:1	Poly	90°	99	1.4	Good
6665	S. G.	Ni-16Cr-5Al-Y_2O_3	1900	Blank	Poly	90°	184	.5	Good
6666	S. G.	Ni-16Cr-5Al-1Y_2O_3	1900	Blank	Poly	90°	184	---	Good
6667	S. G.	Ni-16Cr-5Al-1Y_2O_3	1900	Blank	Poly	90°	181	.5	Good
6668	S. G.	Ni-16Cr-5Al-1Y_2O_3	1900	Blank	Poly	90°	181	.5	Good
6669	S. G.	Ni-16Cr-5Al-1Y_2O_3	1900	Blank	Poly	90°	181	.5	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Nickel Base						
6670	S. G.	Ni-16Cr-5Al-1Y_2O_3	1900	Blank	Poly	90°	182	.5	Good
6671	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	16:1	Poly	90°	112	1.7	Good
6672	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	16:1	Poly	90°	113	2.0	Good
6673	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	10:1	Poly	90°	136	1.8	Good
6674	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	10:1	Poly	90°	97	2.1	Good
6675	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	16:1	Poly	90°	97	2.2	Good
6676	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	16:1	Poly	90°	103	2.2	Good
6677	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	9.6:1	Poly	90°	85	2.4	
6678	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	16:1	Poly	90°	100	2.2	Good
6679	S. G.	Ni-16Cr-5Al-1Y_2O_3	1950	9.6:1	Poly	90°	82	2.4	Good
6680	S. G.	Ni-16Cr-5Al-1Y_2O_3	1850	9.6:1	Poly	90°	92	2.1	Good
6681	S. G.	Ni-16Cr-5Al-1Y_2O_3	1850	9.6:1	Poly	90°	124	2.1	Good
6693	P & W	Astroloy Powder Compacted	1950	3:1	0010	60°	84	1.5	Good
6694	P & W	PWA-849	1950	3:1	0010	60°	81	1.5	Good
6695	P & W	PWA-658	1950	3:1	0010	60°	97	1.5	Good
6696	P & W	PWA-658	1950	3:1	0010	60°	84	1.5	Good
6697	P & W	MARM-200	1950	6:1	0010	90°	97	1.3	Good
6698	P & W	MARM-200	2000	6:1	0010	90°	119	1.3	Good
6699	P & W	PWA-849	2000	3:1	0010	60°	106	1.5	Good
6700	P & W	PWA-658	2000	3:1	0010	60°	116	1.5	Good
6701	P & W	PWA-658	1850	3:1	0010	60°	135	1.4	Fair
6702	P & W	MARM-200	1850	6:1	0010	90°	170	1.0	Good
6703	P & W	MARM-200	2100	6:1	0010	90°	64	1.4	Good
6704	P & W	MARM-200	1900	6:1	0010	90°	101	1.4	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Nickel Base						
6705	P & W	MARM-200	2050	6:1	0010	90°	103	1.4	Good
6706	P & W	MARM-200	2050	8:1	0010	60°	102	1.3	Good
6707	P & W	MARM-200	2050	8:1	0010	60°	116	1.1	Good
6708	P & W	MARM-200	2150	8:1	0010	60°	70	1.4	Good
6710	P & W	IN-100	1950	8:1	0010	60°	98	1.2	Good
6711	P & W	IN-100	1950	8:1	0010	60°	102	1.3	Good
6712	P & W	IN-100	1950	6:1	0010	60°	86	1.4	Good
6713	P & W	PWA-849	1950	6:1	0010	60°	102	1.3	Good
6714	P & W	Astroloy	1850	6:1	0010	90°	151	1.0	Good
6723	Stellite	Ni-16Cr-4Al-1.33Y_2O_3	1900	16:1	Poly	90°	121	2.1	Good
6724	Stellite	Ni-16Cr-4Al-1.33Y_2O_3	1900	16:1	Poly	90°	117	2.1	Good
6725	Stellite	Ni-16Cr-4Al-1.33Y_2O_3	1900	16:1	Poly	90°	118	2.1	Good
6735	P & W	MARM-200	2050	8:1	0010	60°	86	1.3	Good
6736	P & W	MARM-200	2050	8:1	0010	60°	86	1.3	Good
6737	P & W	MARM-200	2050	8:1	0010	60°	86	1.3	Excellent
6738	P & W	MARM-200	2100	8:1	0010	60°	76	1.4	Good
6739	P & W	MARM-200	2100	8:1	0010	60°	78	1.4	Good
6740	P & W	MARM-200	2100	8:1	0010	60°	78	1.3	Good
6744	S. G.	Ni-	1900	Blank	Poly	90°	186	.5	---
6745	S. G.	Ni-	1900	Blank	Poly	90°	188	---	---
6746	S. G.	Ni-	1900	Blank	Poly	90°	186	---	Good
6748	S. G.	Ni-	2000	4:2	Poly	60°	43	---	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Nickel Base						
6749	S. G.	Ni-	2000	4:1	Poly	60°	48	1.4	Good
6750	S. G.	Ni-	2000	4:1	Poly	60°	43	1.4	Good
6761	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	140	1.8	Good
6762	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:L	Poly	90°	133	2.0	Good
6763	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16:1	Poly	90°	137	2.0	Good
6772	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16.3:1	Poly	90°	130	2.0	Good
6773	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	16.3:1	Poly	90°	130	2.0	Good
6774	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	20.5:1	Poly	90°	140	1.6	Good
6775	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	20.5:1	Poly	90°	140	1.7	Good
6776	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	20.5:1	Poly	90°	153	6.0	Good
6777	Stellite	Ni-16Cr-4Al-Y_2O_3	1900	20.5:1	Poly	90°	154	5.2	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Cobalt Base							
5436	Stellite	Co-20Ni-16Cr-4Al-Y_2O_3	2100	15:1	Poly	90°	93	1.9	Good
5612	Battelle	Co-20Cr-6Al-3%Y_2O_3	2200	15.3:1	Poly	90°	84	2.2	Good
5613	Battelle	Co-20Cr-6Al-10W-3%Y_2O_3	2200	15.3:1	Poly	90°	88	2.0	Good
5964	Battelle	Co-20Cr-10Ta-6Al-3V/0-Y_2O_3	2200	17.7:1	Poly	90°	57	2.0	Good
5965	Battelle	Co-20Cr-6Al-10Ta-3V/0-Y_2O_3	2200	17.7:1	Poly	90°	62	2.0	Good
5966	Battelle	Co-20Cr-6Al-.5C-3V/0-Y_2O_3	2200	17.7:1	Poly	90°	65	2.0	Good
5967	Battelle	Co-20Cr-6Al-3V/0Y_2O_3	2200	17.7:1	Poly	90°	62	2.0	Good
6192	Stellite	Co-ODS	2100	16:1	Poly	90°	96	2.1	Good
6193	Stellite	Co-ODS	2100	16:1	Poly	90°	92	2.0	Good
6194	Stellite	Co-ODS	2100	16:1	Poly	90°	92	2.0	Good
6195	Stellite	Co-ODS	2100	16:1	Poly	90°	95	2.0	Good
6196	Stellite	Co-ODS	2100	16:1	Poly	90°	92	2.0	Good
6197	Stellite	Co-ODS	2100	16:1	Poly	90°	86	2.1	Good
6198	Polymet	Co-26Cr-18W	2050	25:1	Poly	90°	140	1.9	Good
6199	Stellite	Co-ODS	2100	20:1	Poly	90°	86	9.0	Good
6200	Stellite	Co-ODS	2100	20:1	Poly	90°	92	9.0	Good
6201	Stellite	Co-ODS	2100	20:1	Poly	90°	97	9.0	Good
6202	Stellite	Co-ODS	2100	20:1	Poly	90°	99	8.0	Good
6203	Stellite	Co-ODS	2100	20:1	Poly	90°	84	9.0	Good
6204	Stellite	Co-ODS	2100	20:1	Poly	90°	86	8.0	Good
6222	Polymet	Co-20W-28Cr	2000	25:1	Poly	90°	100	2.0	Good
6223	Polymet	Co-20W-28Cr	2050	25:1	Poly	90°	135	1.7	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Cobalt Base							
6263	Stellite	ODS Co Alloy	1900	16:1	Poly	90°	122	4.8	Good
6264	Stellite	ODS Co Alloy	1900	16:1	Poly	90°	127	2.0	Good
6265	Stellite	ODS Co Alloy	2000	16:1	Poly	90°	108	5.2	Good
6266	Stellite	ODS Co Alloy	2000	16:1	Poly	90°	111	2.3	Good
6267	Stellite	ODS Co Alloy	2100	16:1	Poly	90°	97	5.2	Good
6268	Stellite	ODS Co Alloy	2100	16:1	Poly	90°	108	2.0	Good
6276	Polymet	Co-20W-28Cr	1950	16.3:1	Poly	60°	97	2.5	Good
6277	Polymet	Co-20W-28Cr	1950	16.3:1	Poly	60°	103	2.5	Good
6278	Polymet	Co-20W-28Cr+∿.07>B>-.004	2050	16:1	Poly	60°	95	2.1	Good
6279	Polymet	Co-20W-28Cr+∿.07>B>-.004	2050	16:1	Poly	60°	105	2.1	Good
6280	Polymet	Co-20W-28Cr+∿.07>B>-.004	2050	16:1	Poly	60°	103	2.1	Good
6281	Polymet	Co-20W-28Cr+∿.07>B>-.004	2050	16:1	Poly	60°	97	2.1	Good
6291	Polytechnic	Co-20W-28Cr+	2050	15.5:1	Poly	90°	113	2.0	Good
6446	Stellite	ODS Co Powder	2100	16:1	Poly	90°	122	5.0	Good
6447	Stellite	ODS Co Powder	2100	16:1	Poly	90°	130	5.0	Good
6627	Polymet	Co-20W-28Cr	1740	8.8:1	Poly	90°	97	2.5	Excellent
6628	Polymet	Co-20W-28Cr	1740	8.9:1	Poly	90°	62	2.5	Excellent
6709	P & W	Co-Tac	2200	8:1	0010	60°	67	1.4	Good
6715	Polymet	Co-20W-28Cr Powder	2000	16:1	Poly	90°	75	1.7	Fair
6716	Polymet	Co-20W-28Cr	2000	16:1	Poly	90°	91	1.7	Good
6717	Polymet	Co-20W-28Cr	2000	16:1	Poly	90°	97	1.6	Good
6718	Polymet	Co-20W-28Cr	2000	20:1	Poly	90°	118	1.6	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Cobalt Base						
6729	Polymet	Co-20W-28Cr	2000	20:1	Poly	90°	116	1.0	Good
6730	Polymet	Co-20W-28Cr	2000	6:1	Poly	90°	97	2.2	Good
6758	Polymet	Co-18Cr-5Mo-2B	1750	16:1	Poly	90°	113	2.0	Good
6759	Polymet	Co-20W-28Cr	2000	9:1	Poly	90°	99	2.0	Good
6760	Polymet	Co-20W-28Cr-	2000	9:1	Poly	90°	102	2.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
		Tungsten Base							
5453	WAESD	W-4.0Re-0.35Hf-.035C	3500	8.5:1	None	60°	173	2.5	Good
5454	WAESD	W-4.0Re-0.35Hf-.035C	2500	8.6:1	None	60°	170	3.0	Good
5455	WAESD	W-4.0Re-0.35Hf-.035C	3500	8.6:1	None	60°	162	7.0	Good
5456	WAESD	W-4.0Re-0.35Hf-.035C	3500	8.6:1	None	60°	157	7.0	Good
5785	WAESD	W-0.35Hf-.035C Powder	3200	7:1	Bare	90°	124	10.0	Good
5833	WAESD	W-0.35Hf-.035C	4000	7:1	Bare	90°R	146	7.0	Good
5834	WAESD	W-0.35Hf-.035C	4000	7:1	Bare	90°R	126	7.5	Good
5835	WAESD	W-0.35Hf-.035C	400	6.8:1	Bare	90°	140	7.0	Good
5836	WAESD	W-0.35Hf-.035C	4000	6.8:1	Bare	90°	146	7.0	Good
6012	WAESD	WHfC	4000	7.39:1	Bare	90°	162	1.0	Good
6013	WAESD	WHfC	4000	6.1:1	Bare	90°	154	8.0	Good
6014	WAESD	WHfC	4000	7:1	Bare	90°	151	7.5	Good
6051	WAESD	WHfC	4000	6:1	Bare	90°	127	7.0	Good
6052	WAESD	WHfC	4000	6:1	Bare	90°	138	7.0	Good
6422	WAESD	WHfC	2300	Blank	Poly	90°	192	1.0	Good
6423	WAESD	WHfC	2300	Blank	Poly	90°	194	1.0	Good
6424	WAESD	WHfC	2300	8:1	Poly	60°	178	---	Fair
6425	WAESD	WHfC	2300	7:1	Poly	90°	194	---	---
6468	WAESD	W-0.35HfC	2300	Blank	Poly	90°	189	1.0	Good
6469	WAESD	W-0.35HfC	2300	6.3:1	Poly	90°	---	---	---
6470	WAESD	W-0.35HfC	2300	Blank	Poly	---	192	10.0	---
6471	WAESD	W-0.35HfC	2300	Blank	Poly	---	193	3.0	---
6472	WAESD	W-0.35HfC	2300	Blank	Poly	---	194	3.0	---

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Tungsten Base						
6513	WAESD	WHfC	2300	6:1	Poly	60°	165	5.0	Good
6514	WAESD	WHfC	2300	6:1	Poly	60°	165	5.0	Fair
6515	WAESD	WHfC	2300	Blank	Poly	90°	198	1.5	Good
6516	WAESD	WHfC	2300	Blank	Poly	90°	---	1.5	Good
6517	WAESD	$WHfH_2$-C	2300	6:1	Poly	60°	167	3.5	Fair
6518	WAESD	$WHfH_2$-C	2300	6:1	Poly	60°	167	4.5	Fair
6519	WAESD	$WHfH_2$-C	2300	Blank	Poly	90°	193	1.5	Fair
6520	WAESD	WHfC	2300	6:1	Poly	60°	189	3.0	Fair
6521	WAESD	WHfC	2300	6:1	Poly	60°	184	3.5	Good
6522	WAESD	$WHfH_2$-C	2300	6:1	Poly	60°	167	4.5	Fair
6523	WAESD	$WHfH_2$-C	2300	Blank	Poly	90°ϕ	189	2.0	Good
6524	WAESD	$WHfH_2$-C	2300	6:1	Poly	60°	167	5.2	Fair
6536	WAESD	W-.3HfC	4000	8:1	Fiske 604	60°	151	5.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Aluminum Base						
5438	ARL & Battelle	Al-4Wt.%Cr	625	40:1	Poly	90°	130	1.0	Good
5439	ARL & Battelle	Al-4Wt.%Cr	625	40:1	Poly	90	127	0.5	Good
5440	ARL & Battelle	Al-4Wt.%Cr	625	40:1	Poly	90°	127	0.5	Good
5472	ARL	Al-0.6W/o-Zr	525	40:1	Poly	90°	108	1.0	Good
5473	ARL	Al-0.6W/o-Zr	625	40:1	Poly	90°	108	.8	Good
5474	ARL	Al-0.6W/o-Zr	625	40:1	Poly	90°	108	.7	Good
5974	AMMRC	Al-4Cu-0.75Mg+5V/0+	800	20:1	Poly	120°	73	1.1	Good
5975	AMMRC	Al-4Cu-0.75Mg-5V/0+	800	20:1	Poly	120°	81	1.1	Good
6178	AFML/LLS	Battelle Flake Powder	800	8:1	C-300	90°	54	0.6	Good
6179	AFML/LLS	Battelle Flake Powder	800	8:1	C-300	90°	51	0.7	Good
6188	U. K.	7075-Al	500	6:1	C-300	60°	65	1.0	Good
6302	Westing-house	7075 T-6Al	300	4:1	C-300	90°	157	.6	Good
6303	Westing-house	7075 T-6Al	300	4:1	C-300	90°	154	.6	Good
6304	Westing-house	7075 T-6Al	300	4:1	C-300	90°	154	.5	Good
6305	Westing-house	7075 T-6Al	300	4:1	C-300	90°	148	---	Good
6306	Westing-house	7075 T-6Al	300	4:1	C-300	90°	154	.4	Good
6307	Westing-house	7075 T-6Al	300	4:1	C-300	90°	154	1.8	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Iron Base							
5761	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-2	2000	Blank	Poly	90°	184	1.0	Good
5762	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-7	2000	Blank	Poly	90°	185	1.0	Good
5763	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-42	2000	Blank	Poly	90°	184	1.0	Good
5764	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-46 Powder	2000	Blank	Poly	90°	182	1.0	Good
5765	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-2	2000	10:1	Poly	60°	77	---	Good
5766	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-7	2000	10:1	Poly	60°	73	2.5	Good
5767	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-42	2000	10:1	Poly	60°	70	2.2	Good
5768	U. of Cin. AFML/LLM Westinghouse	Tool Steel M-46	2000	10:1	Poly	60°	74	2.2	Good
5769	U. of Cin. AFML/LLM Westinghouse	Rene 95 Powder	2050	Blank	Poly	90°	184	1.0	Good
5770	U. of Cin. AFML/LLM Westinghouse	AF2-1DA Powder	2050	Blank	Poly	90°	184	1.0	Good
5771	U. of Cin. AFML/LLM Westinghouse	Rene 95 Powder	2150	10:1	Poly	60°	55	2.2	Good
5772	U. of Cin. AFML/LLM Westinghouse	Ni Base AF2-1DA	2150	10:1	Poly	60°	58	2.2	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{ex} (ips)	Surface
			Iron Base						
5830	G. E.	Fe-Cr-Al-Y_2O_3	1900	10:1	Poly	90°R	86	2.0	Good
5831	G. E.	Fe-Cr-Al-Y_2O_3	1900	10:1	Poly	90°R	90	2.0	Good
5832	G. E.	Fe-Cr-Al-Y_2O_3	1900	10:1	Poly	90°R	86	2.0	Good
5888	G. E.	Fe-Cr-Al-Y_2O_3	1800	10:1	Poly	90°R	109	1.7	Good
5889	G. E.	Fe-Cr-Al-Y_2O_3	1800	10:1	Poly	90°R	120	1.6	Good
5890	G. E.	Fe-Cr-Al-Y_2O_3	1900	10:1	Poly	90°R	97	1.8	Good
5891	G. E.	Fe-Cr-Al-Y_2O_3	1900	10:1	Poly	90°R	86	1.9	Good
6228	P & W	4140 Modi	2300	6:1	Poly	90°	59	2.4	Good
6229	P & W	Fe-64.62-18Cr-8Ni+	2300	6:1	Poly	90°	81	2.3	Good
6230	P & W	4140 Modi.	---	6:1	Poly	90°	53	2.4	Good
6298	Polymet	Fe-Cr-Al-Y	2100	2:1	Bare	Vane	---	---	---
6373	AFML/LLM-1	Fe+.84Mn+.22Mo	1800	20.4:1	Poly	90°	162	1.9	Good
6374	AFML/LLM-1	Fe-.85Mn-1.0+	1800	20.4:1	Poly	90°	182	1.8	Good
6582	Battelle	Fe-Al-1	1832	16:1	Poly	90°	128	1.2	Good
6584	Battelle	Fe-Al-2	1832	16:1	Poly	90°	129	1.3	Good
6646	Battelle	Fe-Al Base	1830	16:1	Poly	---	135	1.0	Good
6664	AFML/MBT	4340 Steel	1550	3:1	Poly	90°	140	1.7	Good

R - Rectangular

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
			Aluminum Base						
6308	Westing-house	7075-T6Al	300	4:1	C-300	90°	154	1.8	Good
6309	Westing-house	7075 T-6Al	300	4:1	C-300	90°	170	1.8	Good
6310	Westing-house	7075 T-6Al	300	4:1	C-300	90°	173	1.7	Good
6311	Westing-house	7075 T-6Al	300	4:1	C-300	90°	170	1.8	Good
6312	Westing-house	7075 T-6Al	300	4:1	C-300	90°	167	1.7	---
6313	Battelle	6063-Al	750	20:1	A-907	90°	53	1.0	Good
6314	Battelle	7075-Al	750	20:1	A-907	90°	---	---	---
6315	Battelle	6063-Al	750	20:1	A-907	90°	59	.4	Good
6316	Battelle	6063-Al	750	20:1	A-907	90°	---	---	---
6317	Battelle	6063-Al	750	20:1	A-907	90°	---	---	---
6318	Battelle	7075-Al	750	20:1	A-907	90°	86	.5	Excellent
6319	Battelle	6063-Al	750	20:1	Bare	Flat	43	.4	Excellent
6320	Battelle	7075-Al	750	20:1	Bare	Flat	86	.4	Excellent
6336	Battelle	6063-Al	600	20:1	C-300	90°	54	2.0	Good
6337	Battelle	6063-Al	600	20:1	C-300	90°	66	2.0	Good
6338	Battelle	7075-Al	750	20:1	C-300	90°	75	1.8	Good
6339	Battelle	7075-Al	750	20:1	C-300	90°	69	2.3	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	V_{e_x} (ips)	Surface
		Copper Base							
6021	AFML/LLM	OFHC Copper	500	2:1	Bare	90°	54	1.6	Good
6022	AFML/LLM	OFHC Copper	500	2:1	C-300	90°	38	1.9	Good
6053	AFML/LLM	OFHC	1200	16:1	Bare	90°	57	2.0	Good
6107	AFML/LLM	OFHC Copper	900	6:1	C-300	60°	80	3.5	Good
6108	AFML/LLM	OFHC Copper	900	6:1	C-300	90°	84	3.8	Good
6109	AFML/LLM	OFHC Copper	900	5.7:1	C-300	120°	76	4.9	Good
6110	AFML/LLM	OFHC Copper	900	10:1	C-300	60°	97	4.9	Good
6111	AFML/LLM	OFHC Copper	900	10:1	C-300	90°	97	4.8	Good
6112	AFML/LLM	OFHC Copper	900	10:1	C-300	120°	97	4.7	Good
6231	AFML/LLM	Bronze 13%Sn	1300	10:1	Poly	90°	105	1.9	Hot Short
6232	AFML/LLM	Bronze+13%Sn	900	10:1	Poly	90°	184	1.4	Good
6233	AFML/LLM	Bronze+13%Sn	900	10:1	Poly	90°	181	3.5	Good
6234	AFML/LLM	Bronze+13%Sn	1100	10:1	Poly	90°	146	1.7	Good
6235	AFML/LLM	Bronze+12%Sn	1100	10:1	Poly	90°	146	4.5	Good
6334	Battelle	Copper	1200	20:1	Poly	90°	85	2.0	Good
6335	Battelle	Copper	1200	20:1	Poly	90°	78	2.4	Good
6512	AFML/LLM	Copper	RM	6:1	---	90°	157	1.0	Good
6535	AFML/LLM	Copper	RM	3.8:1	Fiske 604	60°	180	1.0	Good

MAXIMUM YIELD

Extrusion Number	Agency	Alloy	Temp. °F	Red. Ratio	Billet Lube	Die Angle	P_t (ksi)	Ve_x (ips)	Surface
			Columbium Base						
6075	WAESD	Nb-Co-Al	2400	8:1	Bare	90°	119	8.0	Good
6076	WAESD	Nb-Co-Al	2400	8:1	Bare	90°	116	8.0	Good
6088	WAESD	Nb-Cr-Al	2325	8:1	Bare	90°	59	1.1	Poor
6089	WAESD	Nb-Co-Al	2325	8:1	Bare	90°	65	.9	Poor
6190	WAESD	Nb-C-6 Alloy	3000	5.9:1	Bare	90°R	167	7.0	Excellent
6426	AFML/LLM	Cb+80Sn-20Cu+	900	16:1	C-300	120°	108	---	Good
6581	P & W	Mo-TZM	2800	6:1	Bare	90°	95	2.0	Excellent
6587	P & W	Mo-TZM	2200	6:1	Bare	90°	127	1.2	Excellent
6589	WAESD	Ta-Base Alloy ASTAR-1211C	3200	6:1	Bare	90°	146	7.0	Excellent
6771	Univ. CA	Ta-20Hf	3000	2.5:1	Bare	60°	97	4.5	Excellent
6753	Univ. CA	Ta-20Hf	2350	2.35:1	Poly	60°	56	1.4	Fair

R - Rectangular

AFML	-	Air Force Material Laboratory
G. E.	-	General Electric Corporation
S. M.	-	Special Metals Corporation
Polyt. Inst.	-	Polytechnic Institute
P & W	-	Pratt & Whitney Aircraft
S. G.	-	Sherritt Gordon
U. C.	-	Universal Cyclops
U. K.	-	University of Kentucky
Univ. CN	-	University of Connecticut
Univ. CA	-	University of California
Univ. Cin.	-	University of Cincinnati
WAESD	-	Westinghouse Advanced Energy Systems Division
ARL	-	Air Research Laboratory
Army Res.	-	Army Research Laboratory
WRD	-	Westinghouse Research and Development

R	-	Rectangular
Sq.	-	Square

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